

Manual Transmission Workshop Manual M15M–D

FOREWORD

This manual explains the service points for the above-indicated automotive system. This manual covers all models with the above-indicated automotive system, not any one specific model.

In order to do these procedures safely, quickly, and correctly, you must first read this manual and any other relevant service materials carefully.

All the contents of this manual, including drawings and specifications, are the latest available at the time of printing. As modifications affecting repair or maintenance occur, relevant information supplementary to this volume will be made available at Mazda dealers. This manual should be kept up-to-date.

Mazda Motor Corporation reserves the right to alter the specifications and contents of this manual without obligation or advance notice.

All rights reserved. No part of this book may be reproduced or used in any form or by any means, electronic or mechanical—including photocopying and recording and the use of any kind of information storage and retrieval system—without permission in writing.

Mazda Motor Corporation
HIROSHIMA, JAPAN

CONTENTS

Title	Section
GENERAL INFORMATION	00
TRANSMISSION/TRANSAXLE	05

© 2005 Mazda Motor Corporation
PRINTED IN U.S.A., JUNE 2005
Form No. 1847–1U–05F
Part No. 9999–95–421H–06

GENERAL INFORMATION

00
SECTION

00-00

GENERAL INFORMATION 00-00

00-00 GENERAL INFORMATION

HOW TO USE THIS MANUAL	00-00-2	Inspection During Removal,	
Range of Topics	00-00-2	Disassembly	00-00-6
Service Procedure	00-00-2	Arrangement of Parts	00-00-7
Symbols	00-00-4	Cleaning of Parts	00-00-7
Advisory Messages	00-00-4	Reassembly	00-00-7
UNITS	00-00-5	Adjustment	00-00-8
Conversion to SI Units		Rubber Parts and Tubing	00-00-8
(Système International d'Unités)	00-00-5	Hose Clamps	00-00-8
Rounding Off	00-00-5	Torque Formulas	00-00-8
Upper and Lower Limits	00-00-5	Vise	00-00-9
FUNDAMENTAL PROCEDURES	00-00-6	ELECTRICAL SYSTEM	00-00-9
Preparation of Tools and		Connectors	00-00-9
Measuring Equipment	00-00-6	SAE STANDARDS	00-00-10
Special Service Tools	00-00-6	ABBREVIATIONS	00-00-11
Disassembly	00-00-6		

GENERAL INFORMATION

HOW TO USE THIS MANUAL

E5U000000000M01

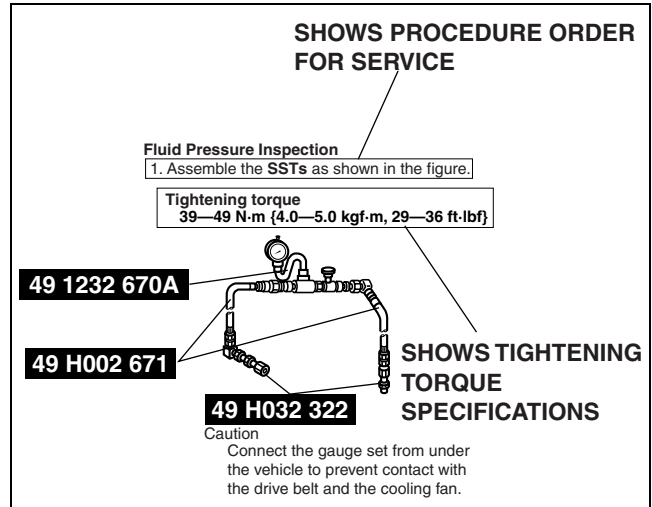
Range of Topics

- This manual contains procedures for performing all required service operations. The procedures are divided into the following five basic operations:
 - Removal/Installation
 - Disassembly/Assembly
 - Replacement
 - Inspection
 - Adjustment
- Simple operations which can be performed easily just by looking at the vehicle (i.e., removal/installation of parts, jacking, vehicle lifting, cleaning of parts, and visual inspection) have been omitted.

Service Procedure

Inspection, adjustment

- Inspection and adjustment procedures are divided into steps. Important points regarding the location and contents of the procedures are explained in detail and shown in the illustrations.



WGIWXX0009E

GENERAL INFORMATION

00-00

Repair procedure

1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual part inspection. However, only removal/installation procedures that need to be performed methodically have written instructions.
2. Expendable parts, tightening torques, and symbols for oil, grease, and sealant are shown in the overview illustration. In addition, symbols indicating parts requiring the use of special service tools or equivalent are also shown.
3. Procedure steps are numbered and the part that is the main point of that procedure is shown in the illustration with the corresponding number. Occasionally, there are important points or additional information concerning a procedure. Refer to this information when servicing the related part.

Procedure

"Removal/Installation" Portion

"Inspection After Installation" Portion

INSTALL THE PARTS BY PERFORMING STEPS 1—3 IN REVERSE ORDER

SHOWS SERVICE ITEM (S)

INDICATES ANY RELEVANT REFERENCES WHICH NEED TO BE FOLLOWED DURING INSTALLATION

SHOWS SPECIAL SERVICE TOOL (SST) FOR SERVICE OPERATION

SHOWS APPLICATION POINTS OF GREASE, ETC.

SHOWS TIGHTENING TORQUE SPECIFICATIONS

SHOWS NON-REUSEABLE PARTS

SHOWS DETAILS

SHOWS TIGHTENING TORQUE UNITS

SHOWS THERE ARE REFERRAL NOTES FOR SERVICE

SHOWS REFERRAL NOTES FOR SERVICE

LOWER TRAILING LINK, UPPER TRAILING LINK REMOVAL/INSTALLATION

1. Jack up the rear of the vehicle and support it with safety stands.
2. Remove the undercover. (See 01-10-4 Undercover Removal)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Inspect the rear wheel alignment and adjust it if necessary.

SHOWS TIGHTENING TORQUE SPECIFICATIONS

44—60 (4.4—6.2, 32—44)

94—116 (9.5—11.9, 69—86)

43—56 (4.3—5.8, 32—41)

118—156 (12.0—16.0, 87—115)

N-m (kgf-m, ft-lbf)

1	Split pin
2	Nut
3	Lower trailing link ball joint (See 02-14-5 Lower Trailing Link Ball Joint Removal Note)
4	Bolt
5	Lower trailing link
6	Dust boot (lower trailing link)

7	Split pin
8	Nut
9	Upper trailing link ball joint (See 02-14-5 Upper Trailing Link Ball Joint Removal Note)
10	Nut
11	Upper trailing link
12	Dust boot (upper trailing link)

Lower Trailing Link Ball Joint, Upper Trailing Link Ball Joint Removal Note

- Remove the ball joint using the SSTs.

SHOWS SPECIAL SERVICE TOOL (SST) NO.

49 T028 304 UPPER TRAILING LINK

49 T028 305 LOWER TRAILING LINK

49 T028 303









KNUCKLE

BHE0000W104

GENERAL INFORMATION

Symbols

- There are eight symbols indicating oil, grease, fluids, sealant, and the use of **SST** or equivalent. These symbols show application points or use of these materials during service.

Symbol	Meaning	Kind
	Apply oil	New appropriate engine oil or gear oil
	Apply brake fluid	New appropriate brake fluid
	Apply automatic transaxle/transmission fluid	New appropriate automatic transaxle/transmission fluid
	Apply grease	Appropriate grease
	Apply sealant	Appropriate sealant
	Apply petroleum jelly	Appropriate petroleum jelly
	Replace part	O-ring, gasket, etc.
	Use SST or equivalent	Appropriate tools

Advisory Messages

- You will find several **Warnings**, **Cautions**, **Notes**, **Specifications** and **Upper and Lower Limits** in this manual.

Warning

- A Warning indicates a situation in which serious injury or death could result if the warning is ignored.

Caution

- A Caution indicates a situation in which damage to the vehicle or parts could result if the caution is ignored.

Note

- A Note provides added information that will help you to complete a particular procedure.

Specification

- The values indicate the allowable range when performing inspections or adjustments.

Upper and lower limits

- The values indicate the upper and lower limits that must not be exceeded when performing inspections or adjustments.

UNITS

E5U000000000M02

00-00

Electric current	A (ampere)
Electric power	W (watt)
Electric resistance	ohm
Electric voltage	V (volt)
Length	mm (millimeter)
	in (inch)
Negative pressure	kPa (kilo pascal)
	mmHg (millimeters of mercury)
	inHg (inches of mercury)
Positive pressure	kPa (kilo pascal)
	kgf/cm ² (kilogram force per square centimeter)
	psi (pounds per square inch)
Number of revolutions	rpm (revolutions per minute)
Torque	N·m (Newton meter)
	kgf·m (kilogram force meter)
	kgf·cm (kilogram force centimeter)
	ft·lbf (foot pound force)
	in·lbf (inch pound force)
Volume	L (liter)
	US qt (U.S. quart)
	Imp qt (Imperial quart)
	ml (milliliter)
	cc (cubic centimeter)
	cu in (cubic inch)
	fl oz (fluid ounce)
Weight	g (gram)
	oz (ounce)

Conversion to SI Units (Système International d'Unités)

- All numerical values in this manual are based on SI units. Numbers shown in conventional units are converted from these values.

Rounding Off

- Converted values are rounded off to the same number of places as the SI unit value. For example, if the SI unit value is 17.2 and the value after conversion is 37.84, the converted value will be rounded off to 37.8.

Upper and Lower Limits

- When the data indicates upper and lower limits, the converted values are rounded down if the SI unit value is an upper limit and rounded up if the SI unit value is a lower limit. Therefore, converted values for the same SI unit value may differ after conversion. For example, consider 2.7 kgf/cm² in the following specifications:

210—260 kPa {2.1—2.7 kgf/cm², 30—38 psi}
270—310 kPa {2.7—3.2 kgf/cm², 39—45 psi}

- The actual converted values for 2.7 kgf/cm² are 264 kPa and 38.4 psi. In the first specification, 2.7 is used as an upper limit, so the converted values are rounded down to 260 and 38. In the second specification, 2.7 is used as a lower limit, so the converted values are rounded up to 270 and 39.

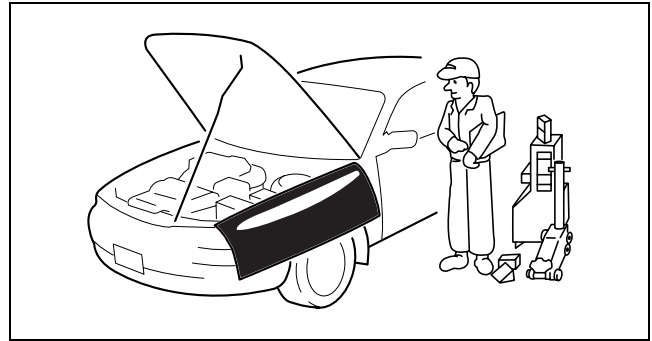
GENERAL INFORMATION

FUNDAMENTAL PROCEDURES

E5U00000000M03

Preparation of Tools and Measuring Equipment

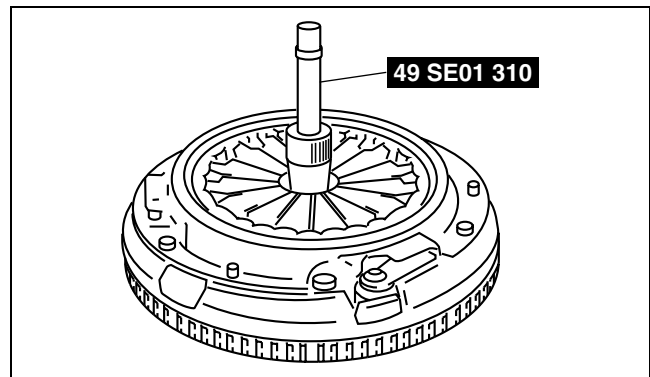
- Be sure that all necessary tools and measuring equipment are available before starting any work.



CHU0014W003

Special Service Tools

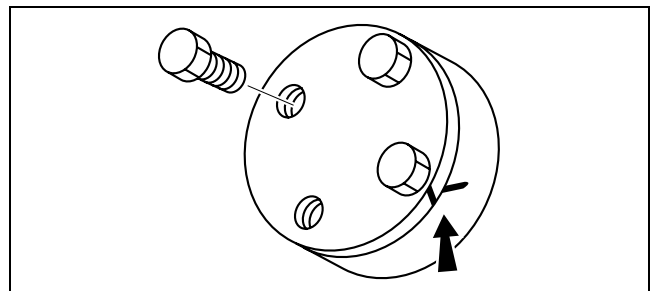
- Use special service tools or equivalent when they are required.



WGIWXX0024E

Disassembly

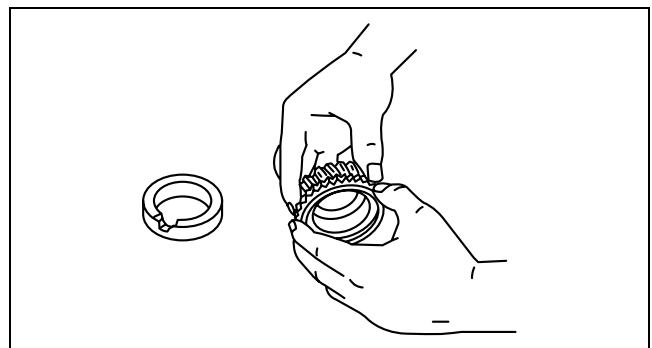
- If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be marked in a place that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.



WGIWXX0027E

Inspection During Removal, Disassembly

- When removed, each part should be carefully inspected for malfunction, deformation, damage and other problems.

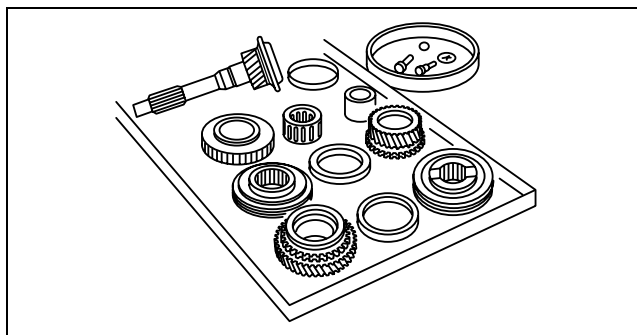


WGIWXX0028E

GENERAL INFORMATION

Arrangement of Parts

- All disassembled parts should be carefully arranged for reassembly.
- Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.



WGIWXX0029E

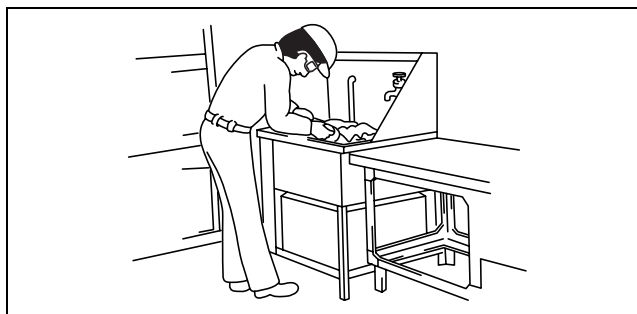
00-00

Cleaning of Parts

- All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.

Warning

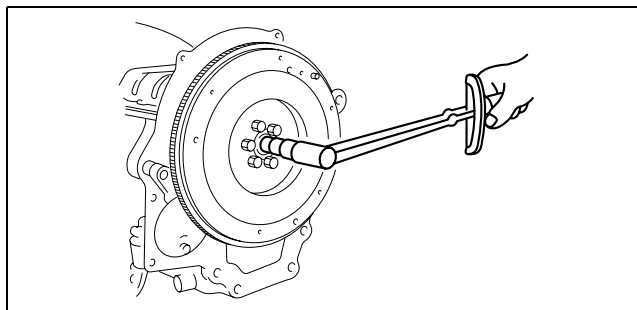
- **Using compressed air can cause dirt and other particles to fly out causing injury to the eyes. Wear protective eye wear whenever using compressed air.**



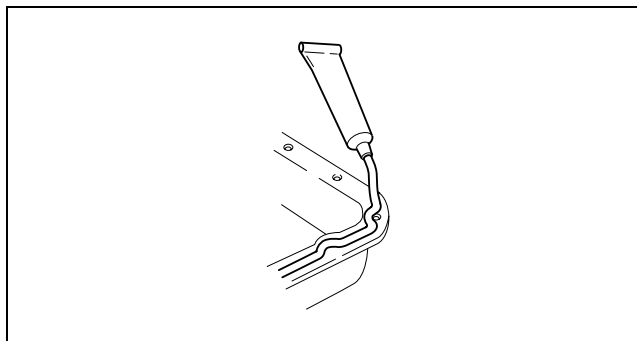
C5U0000W001

Reassembly

- Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
- If removed, the following parts should be replaced with new ones:
 - Oil seals
 - Gaskets
 - O-rings
 - Lockwashers
 - Cotter pins
 - Nylon nuts
- Depending on location:
 - Sealant and gaskets, or both, should be applied to specified locations. When sealant is applied, parts should be installed before sealant hardens to prevent leakage.
 - Oil should be applied to the moving components of parts.
 - Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



WGIWXX0031E

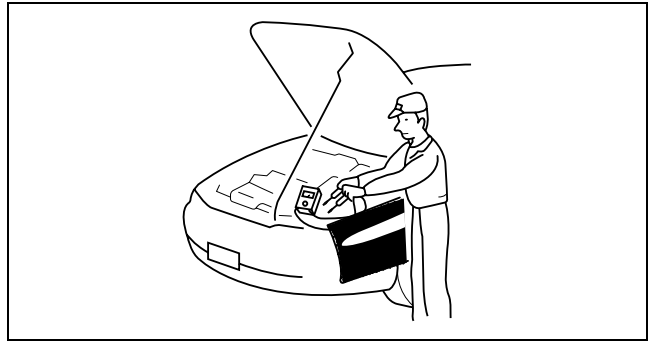


CHU0014W006

GENERAL INFORMATION

Adjustment

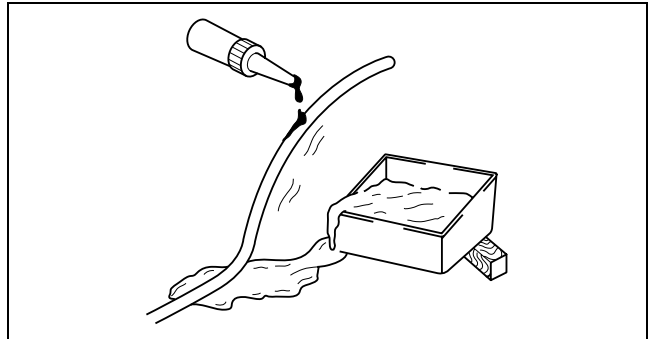
- Use suitable gauges and testers when making adjustments.



CHU0014W005

Rubber Parts and Tubing

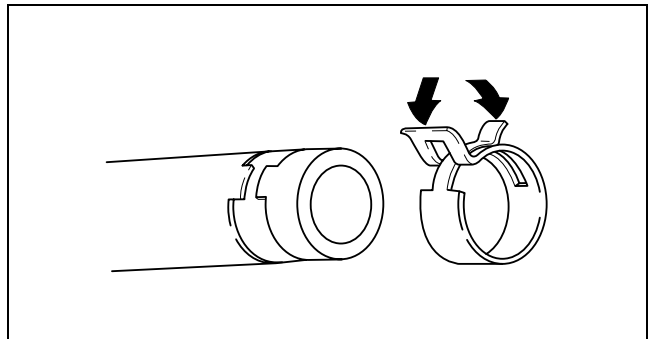
- Prevent gasoline or oil from getting on rubber parts or tubing.



WGIWXX0034E

Hose Clamps

- When reinstalling, position the hose clamp in the original location on the hose and squeeze the clamp lightly with large pliers to ensure a good fit.

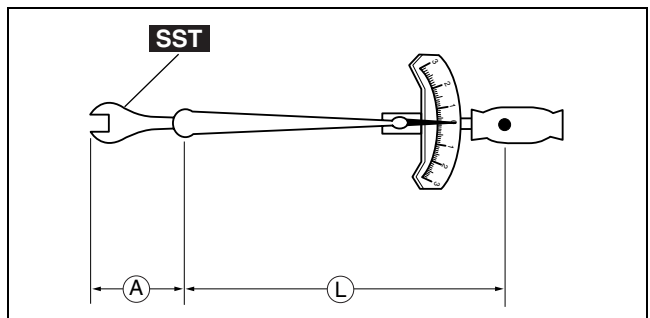


WGIWXX0035E

Torque Formulas

- When using a torque wrench-SST or equivalent combination, the written torque must be recalculated due to the extra length that the SST or equivalent adds to the torque wrench. Recalculate the torque by using the following formulas. Choose the formula that applies to you.

Torque Unit	Formula
N·m	$N \cdot m \times [L / (L+A)]$
kgf·m	$kgf \cdot m \times [L / (L+A)]$
kgf·cm	$kgf \cdot cm \times [L / (L+A)]$
ft·lbf	$ft \cdot lbf \times [L / (L+A)]$
in·lbf	$in \cdot lbf \times [L / (L+A)]$



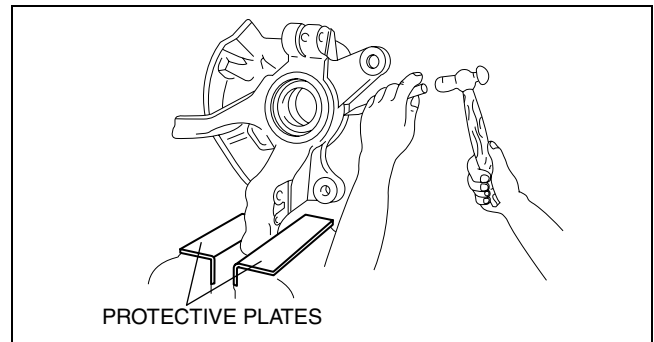
WGIWXX0036E

A : The length of the **SST** past the torque wrench drive.
L : The length of the torque wrench.

GENERAL INFORMATION

Vise

- When using a vise, put protective plates in the jaws of the vise to prevent damage to parts.



CHU0014W010

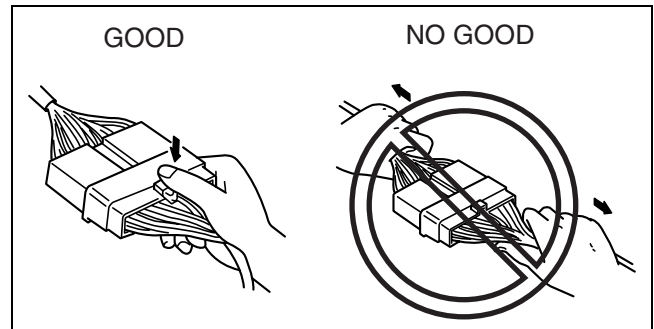
E5U00000000M04

ELECTRICAL SYSTEM

Connectors

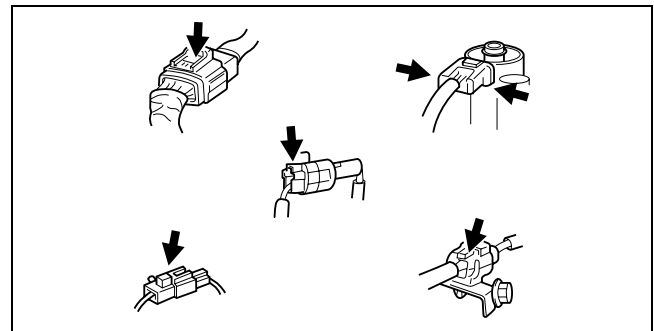
Disconnecting connectors

- When disconnecting connector, grasp the connectors, not the wires.



CHU0000W014

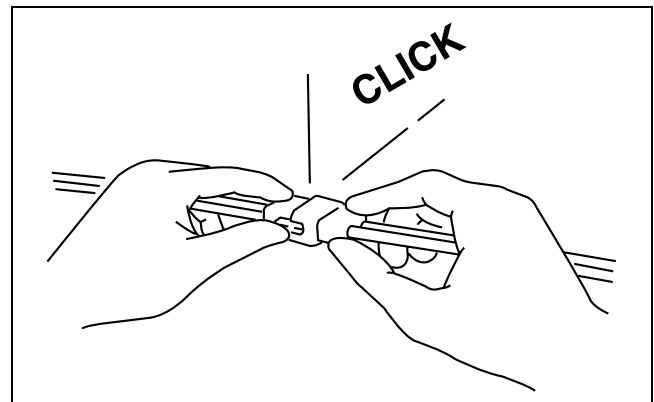
- Connectors can be disconnected by pressing or pulling the lock lever as shown.



WGIWXX0042E

Locking connector

- When locking connectors, listen for a click indicating they are securely locked.



WGIWXX0043E

00-00

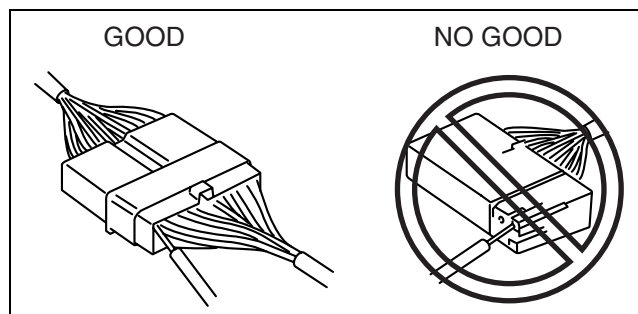
GENERAL INFORMATION

Inspection

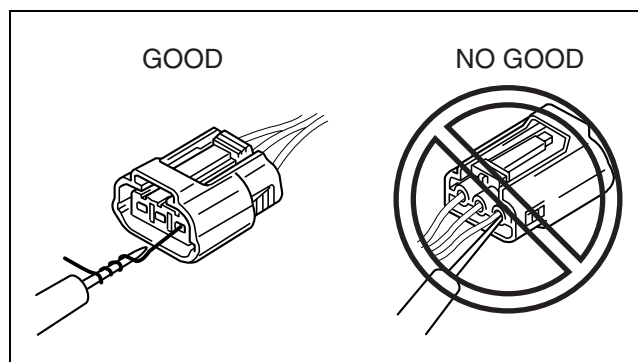
- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.
- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

Caution

- To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.



CHU0000W011



CHU0000W012

SAE STANDARDS

E5U000000000M07

- In accordance with new regulations, SAE (Society of Automotive Engineers) standard names and abbreviations are now used in this manual. The table below lists the names and abbreviations that have been used in Mazda manuals up to now and their SAE equivalents.

SAE Standard			SAE Standard		
Abbreviation	Name	Remark	Abbreviation	Name	Remark
AP	Accelerator Pedal		MAP	Manifold Absolute Pressure	
APP	Accelerator Pedal Position		MAF	Mass Air Flow	
ACL	Air Cleaner		MAF sensor	Mass Air Flow Sensor	
A/C	Air Conditioning		MFL	Multiport Fuel Injection	
A/F	Air Fuel Ratio		OBD	On-board Diagnostic System	
BARO	Barometric Pressure		OL	Open Loop	
B+	Battery Positive Voltage		OC	Oxidation Catalytic Converter	
CMP sensor	Camshaft Position Sensor		O2S	Oxygen Sensor	
LOAD	Calculated Load Value		PNP	Park/Neutral Position	
CAC	Charge Air Cooler		PID	Parameter Identification	
CLS	Closed Loop System		PSP	Power Steering Pressure	
CTP	Closed Throttle Position		PCM	Powertrain Control Module	#3
CPP	Clutch Pedal Position		PAIR	Pulsed Secondary Air Injection	Pulsed injection
CIS	Continuous Fuel Injection System		AIR	Secondary Air Injection	Injection with air pump
CKP sensor	Crankshaft Position Sensor		SAPV	Secondary Air Pulse Valve	
DLC	Data Link Connector		SFI	Sequential Multiport Fuel Injection	
DTM	Diagnostic Test Mode	#1	3GR	Third Gear	
DTC	Diagnostic Test Code(s)		TWC	Three Way Catalytic Converter	
DI	Distributor Ignition		TB	Throttle Body	
DLI	Distributorless Ignition		TP	Throttle Position	
EI	Electronic Ignition	#2	TP sensor	Throttle Position Sensor	
ECT	Engine Coolant Temperature		TCC	Torque Converter Clutch	
EM	Engine Modification				
EVAP	Evaporative Emission				
EGR	Exhaust Gas Recirculation				
FC	Fan Control				

GENERAL INFORMATION

SAE Standard		Remark	SAE Standard		Remark
Abbreviation	Name		Abbreviation	Name	
FF	Flexible Fuel		TCM	Transmission (Transaxle) Control Module	
4GR	Fourth Gear		TR	Transmission (Transaxle) Range	
GEN	Generator		TC	Turbocharger	
GND	Ground		VSS	Vehicle Speed Sensor	
HO2S	Heated Oxygen Sensor	With heater	VR	Voltage Regulator	
IAC	Idle Air Control		VAF sensor	Volume Air Flow Sensor	
IAT	Intake Air Temperature		WU-TWC	Warm Up Three Way Catalytic Converter	#4
KS	Knock Sensor		WOP	Wide Open Throttle	
MIL	Malfunction Indicator Lamp				

#1 : Diagnostic trouble codes depend on the diagnostic test mode.

#2 : Controlled by the PCM

#3 : Device that controls engine and powertrain

#4 : Directly connected to exhaust manifold

ABBREVIATIONS

SST	Special Service Tools
-----	-----------------------

E5U000000000M06

00-00

TRANSMISSION/TRANSAXLE

05
SECTION

05-11

MANUAL TRANSMISSION 05-11
TECHNICAL DATA 05-50

SERVICE TOOLS 05-60

05-11 MANUAL TRANSMISSION

GENERAL PROCEDURES (MANUAL

TRANSMISSION) 05-11-2

Precaution 05-11-2

HOUSING COMPONENTS

DISASSEMBLY 05-11-3

Transmission Case

Disassembly Note 05-11-4

HOUSING COMPONENTS

ASSEMBLY 05-11-4

Oil Seal Assembly Note 05-11-5

Transmission Case And Extension

Housing Assembly Note 05-11-5

Main Drive Gear Bearing

Assembly Note 05-11-5

Countershaft Front Bearing

Assembly Note 05-11-6

Adjustment Shim Assembly Note 05-11-6

Front Cover Assembly Note 05-11-7

SHIFT FORK AND SHIFT ROD PARTS

DISASSEMBLY/ASSEMBLY 05-11-7

Clip Disassembly Note 05-11-8

Spring and Ball Assembly Note 05-11-8

5th/reverse Shift Fork and Rod

Assembly Note 05-11-9

Spring, Clip Assembly Note 05-11-9

Interlock Pin Assembly Note 05-11-10

1st/2nd Shift Fork and Rod, 3rd/4th

Shift Fork and Rod, and Interlock Pin

Assembly Note 05-11-10

Intermediate Housing

Assembly Note 05-11-11

SHIFT FORK AND SHIFT ROD PARTS

INSPECION 05-11-11

Springs Inspection 05-11-11

Intermediate Housing Inspection 05-11-12

1st/2nd, 3rd/4th and 5th/reverse

Shift Fork Inspection 05-11-12

MAINSHAFT AND COUNTERSHAFT

PARTS DISASSEMBLY 05-11-13

Mainshaft Rear Bearing

Disassembly Note 05-11-14

Locknut (Countershaft)

Disassembly Note 05-11-15

Countershaft Rear Bearing

Disassembly Note 05-11-15

Locknut (Mainshaft)

Disassembly Note 05-11-15

Main Drive Gear Bearing

Disassembly Note 05-11-16

Countershaft Front Bearing

Disassembly Note 05-11-16

Bearing Housing Component

Disassembly Note 05-11-16

MAINSHAFT AND COUNTERSHAFT

PARTS ASSEMBLY 05-11-17

Mainshaft Gear Component and

Countershaft Assembly Note 05-11-18

Locknut (Mainshaft) Assembly Note 05-11-18

Thrust Lock Washer Assembly Note 05-11-19

Mainshaft Rear Bearing

Assembly Note 05-11-19

Countershaft Rear Bearing

Assembly Note 05-11-20

Locknut (Countershaft)

Assembly Note 05-11-20

MAINSHAFT AND COUNTERSHAFT

PARTS INSPECTION 05-11-20

Bearing Inspection 05-11-20

Each Gear and Main Drive Gear

Inspection 05-11-20

Clutch Hub Component Inspection 05-11-21

Synchronizer Ring (4th, 5th and reverse)

Inspection 05-11-21

Countershaft Inspection 05-11-21

MAINSHAFT PARTS

DISASSEMBLY/ASSEMBLY 05-11-22

3rd/4th Clutch Hub Component

Disassembly Note 05-11-23

1st/2nd Clutch Hub Component

Disassembly Note 05-11-23

1st, 2nd and 3rd synchronizer

component Assembly Note 05-11-24

1st/2nd and 3rd/4th Clutch Hub

Component Assembly Note 05-11-24

MAINSHAFT PARTS INSPECTION 05-11-24

Each Gear Inspection 05-11-24

Clutch Hub Component Inspection 05-11-25

Synchronizer Component

(1st, 2nd and 3rd) Inspection 05-11-25

Mainshaft Inspection 05-11-25

BEARING HOUSING COMPONENT

DISASSEMBLY/ASSEMBLY 05-11-26

Reverse Idler Gear Shaft

Disassembly Note 05-11-27

MANUAL TRANSMISSION

Mainshaft Front Bearing Disassembly Note	05-11-27
Countershaft Center Bearing Disassembly Note	05-11-27
Countershaft Center Bearing Adjustment Shim Assembly Note	05-11-27
Countershaft Center Bearing Assembly Note	05-11-28
Mainshaft Front Bearing Adjustment Shim Assembly Note	05-11-28
Mainshaft Front Bearing Assembly Note	05-11-28
Reverse Idler Gear Shaft Assembly Note	05-11-28

Reverse Idler Gear Assembly Note ...	05-11-29
BEARING HOUSING COMPONENT INSPECTION	05-11-29
Reverse Idler Gear and Shaft Inspection	05-11-29
Bearing Inspection	05-11-29
EXTENSION HOUSING PARTS DISASSEMBLY/ASSEMBLY	05-11-30
Roll Pin Disassembly Note	05-11-30
Oil Seal (control rod) Disassembly Note	05-11-31
Oil Seal (control rod) Assembly Note	05-11-31
Control case Assembly Note	05-11-32

GENERAL PROCEDURES (MANUAL TRANSMISSION)

E5U05110000M01

Precaution

Transmission disassembly/assembly

- Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvent before disassembly.

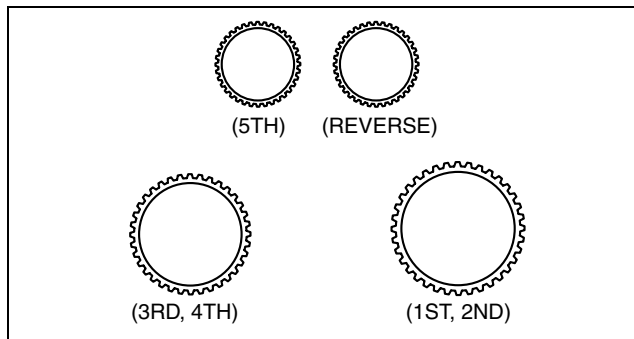
Warning

- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

- Clean the removed parts (except sealed bearings) and all sealing surfaces with cleaning solvent, and dry with compressed air. Clean out all holes and passages with compressed air, and verify that there are no obstructions.
- All O-ring and gaskets must be replaced with the new ones included in the overhaul kit.
- Before assembly, make sure all parts are completely clean.
- Assemble the parts within **10 min** after applying sealant. Allow all sealant to cure at least **30 min** after assembly before filling the transmission with transmission oil.

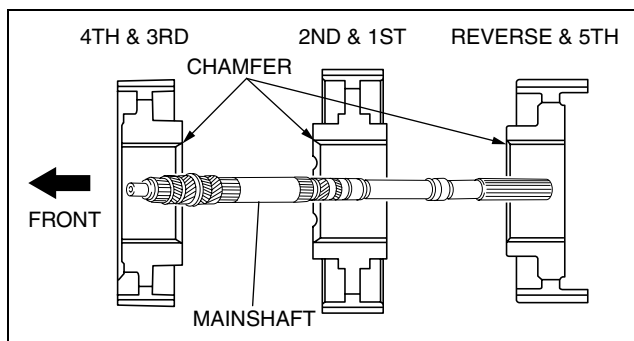
Clutch hub

- For the synchronizer components, align the synchronizer ring grooves and synchronizer keys.
- The synchronizer rings can be distinguished as shown in the figure. The inner diameter of the 2nd synchronizer ring is larger than the 1st.



E5U511AM5033

- When installing the gears and clutch hub components in the following procedure, make sure that they are installed in the direction shown in the figure.



E5U511AM5034

MANUAL TRANSMISSION

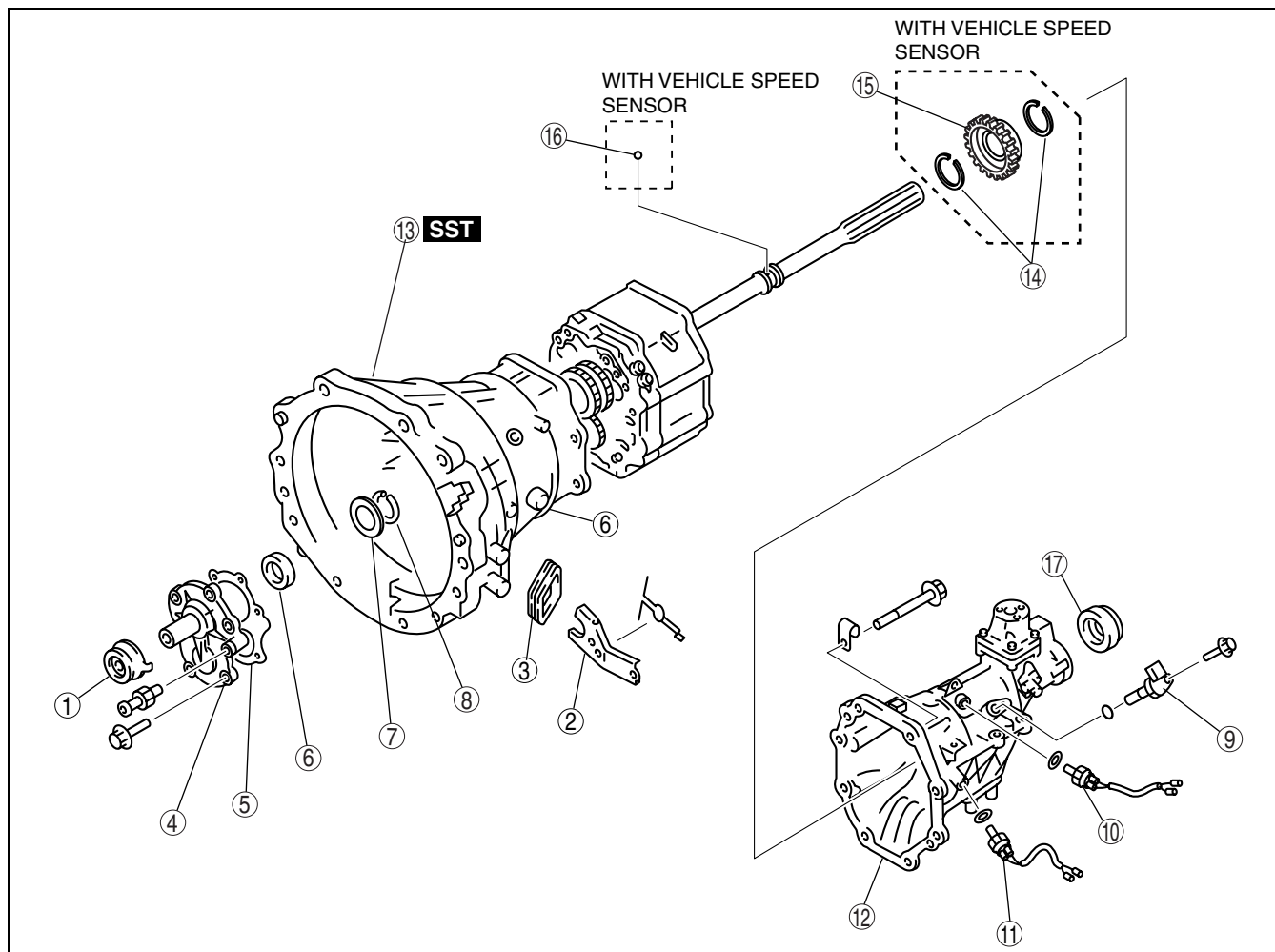
HOUSING COMPONENTS DISASSEMBLY

E5U051117011M01

Note

- The front and rear oil seals do not need to be removed unless you are replacing them.

1. Disassemble in the order indicated in the table.



E5U511AM5035

1	Clutch release collar
2	Clutch release fork
3	Boot
4	Front cover
5	Gasket
6	Oil seal (front)
7	Adjustment shim
8	Snap ring
9	Vehicle speed sensor or hole cover

10	Neutral switch
11	Back-up light switch
12	Extension housing
13	Transmission case (See 05-11-4 Transmission Case Disassembly Note)
14	Snap ring
15	Sensor rotor
16	Steel ball
17	Oil seal (rear)

05-11

05-11-4

MANUAL TRANSMISSION

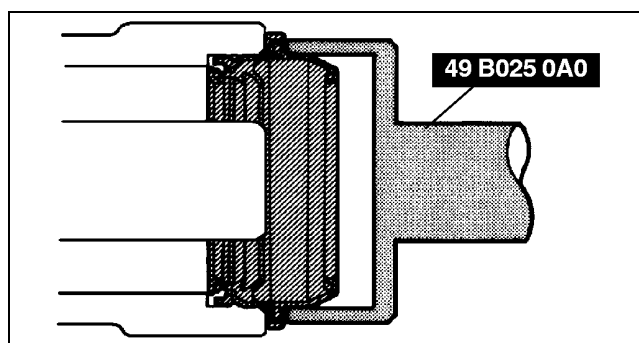
6	Transmission case (See 05-11-5 Transmission Case And Extension Housing Assembly Note.)
7	Extension housing (See 05-11-5 Transmission Case And Extension Housing Assembly Note.)
8	Main drive gear bearing (See 05-11-5 Main Drive Gear Bearing Assembly Note.)
9	Snap ring
10	Counter shaft front bearing (See 05-11-6 Countershaft Front Bearing Assembly Note.)
11	Adjustment shim (See 05-11-6 Adjustment Shim Assembly Note.)

12	Oil seal (front)
13	Gasket
14	Front cover (See 05-11-7 Front Cover Assembly Note.)
15	Vehicle speed sensor or hole cover
16	Neutral switch
17	Back-up light switch
18	Boot
19	Clutch release fork
20	Clutch release collar

05-11

Oil Seal Assembly Note

1. Apply transmission oil to the outer periphery.
2. Install a new oil seal with the **SST**.



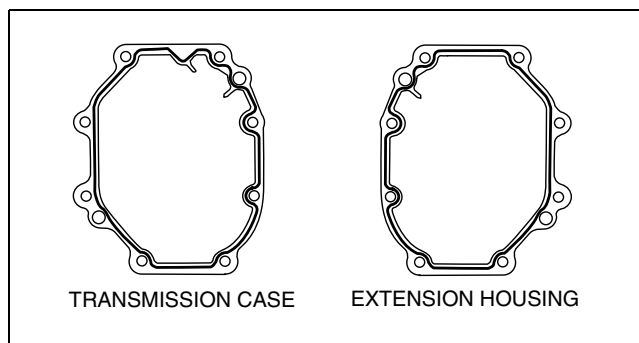
A5U0511W005

Transmission Case And Extension Housing Assembly Note

1. Apply sealant to the contact surfaces of the transmission case and extension housing as shown in the figure.
2. Install the transmission case and extension housing.
3. Apply sealant to the bolt threads, and install the bolts.

Tightening torque

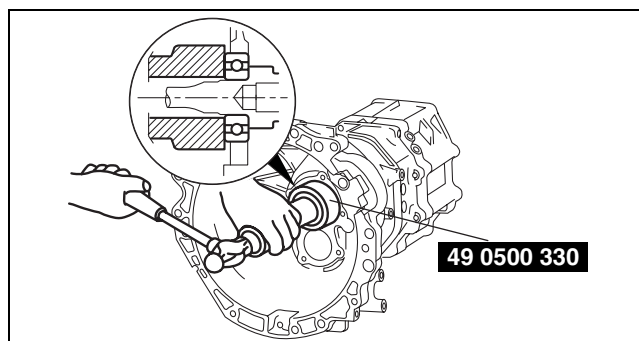
22—30 N·m {2.3—3.0 kgf·m, 17—22 ft·lbf}



E5U511AM5053

Main Drive Gear Bearing Assembly Note

1. Install the main drive gear bearing using the **SST**, and secure it with a new snap ring.

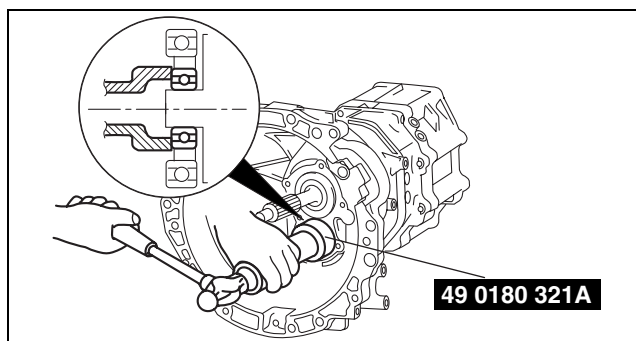


E5U511AM5056

MANUAL TRANSMISSION

Countershaft Front Bearing Assembly Note

1. Install the countershaft front bearing using the SST.



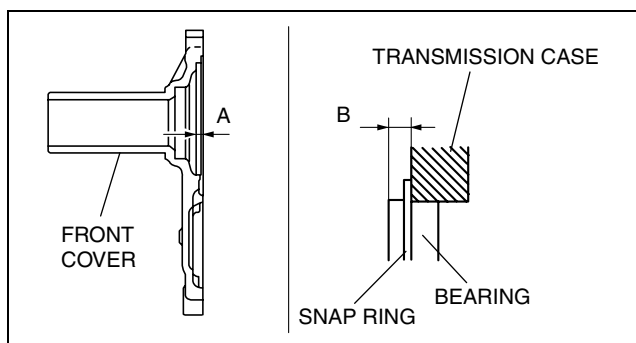
E5U511AM5055

Adjustment Shim Assembly Note

1. After measuring dimensions A and B shown in the figure, use the adjustment shim(s) of the thickness corresponding to the value of A minus B, so that the bearing end play will be within the specification.

Bearing end play

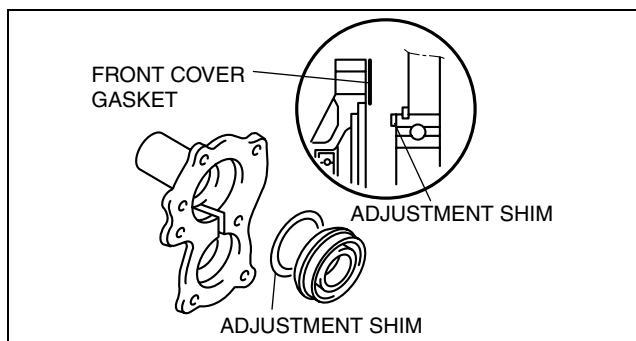
0—0.1 mm {0—0.004 in}



E5U511AM5037

Adjustment shim thickness

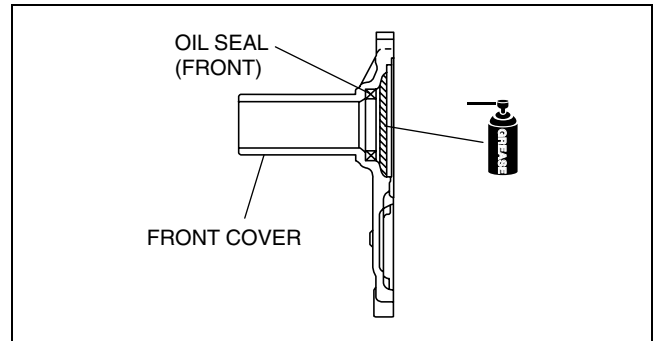
Thickness (mm {in})
0.30 mm {0.012 in}
0.35 mm {0.014 in}
0.40 mm {0.016 in}
0.45 mm {0.018 in}
0.50 mm {0.020 in}
0.55 mm {0.022 in}
0.60 mm {0.024 in}
0.65 mm {0.026 in}
0.70 mm {0.028 in}
0.75 mm {0.030 in}
0.80 mm {0.031 in}
0.85 mm {0.033 in}
0.90 mm {0.035 in}
0.95 mm {0.037 in}
1.0 mm {0.039 in}



E5U511AM5038

Front Cover Assembly Note

1. Install the oil seal (front) onto the front cover.
2. Apply grease to the shaded area of the front cover.
3. Install the front cover.



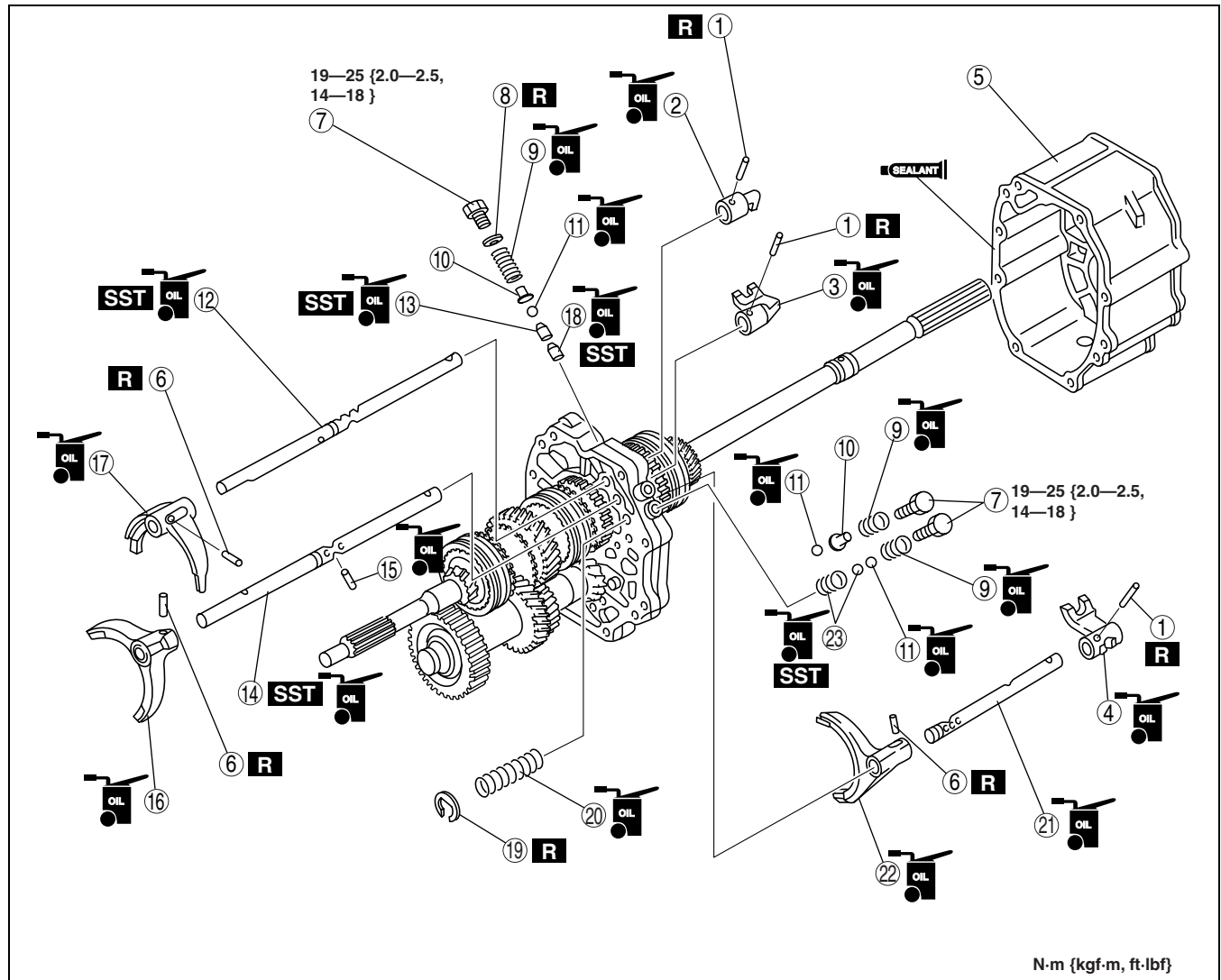
E5U511AM5039

05-11

SHIFT FORK AND SHIFT ROD PARTS DISASSEMBLY/ASSEMBLY

E5U051117030M01

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



E5U511AM5040

1	Roll pin
2	1st/2nd shift rod end
3	3rd/4th shift rod end
4	5th/reverse shift rod end
5	Intermediate housing (See 05-11-11 Intermediate Housing Assembly Note.)

6	Roll pin
7	Cap plug
8	Washer
9	Spring
10	Spring seat
11	Detent ball

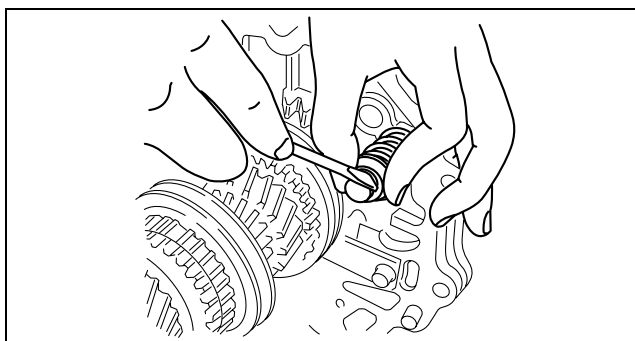
MANUAL TRANSMISSION

12	1st/2nd shift rod (See 05-11-10 1st/2nd Shift Fork and Rod, 3rd/4th Shift Fork and Rod, and Interlock Pin Assembly Note.)
13	Interlock pin (See 05-11-10 1st/2nd Shift Fork and Rod, 3rd/4th Shift Fork and Rod, and Interlock Pin Assembly Note.)
14	3rd/4th shift rod (See 05-11-10 1st/2nd Shift Fork and Rod, 3rd/4th Shift Fork and Rod, and Interlock Pin Assembly Note.)
15	Interlock pin (See 05-11-10 1st/2nd Shift Fork and Rod, 3rd/4th Shift Fork and Rod, and Interlock Pin Assembly Note.)
16	3rd/4th shift fork (See 05-11-10 1st/2nd Shift Fork and Rod, 3rd/4th Shift Fork and Rod, and Interlock Pin Assembly Note.)

17	1st/2nd shift fork (See 05-11-10 1st/2nd Shift Fork and Rod, 3rd/4th Shift Fork and Rod, and Interlock Pin Assembly Note.)
18	Interlock pin (See 05-11-10 Interlock Pin Assembly Note.)
19	Clip (See 05-11-8 Clip Disassembly Note.) (See 05-11-9 Spring, Clip Assembly Note.)
20	Spring (See 05-11-9 Spring, Clip Assembly Note.)
21	5th/reverse shift rod (See 05-11-9 5th/reverse Shift Fork and Rod Assembly Note.)
22	5th/reverse shift fork (See 05-11-9 5th/reverse Shift Fork and Rod Assembly Note.)
23	Spring and ball (See 05-11-8 Spring and Ball Assembly Note.)

Clip Disassembly Note

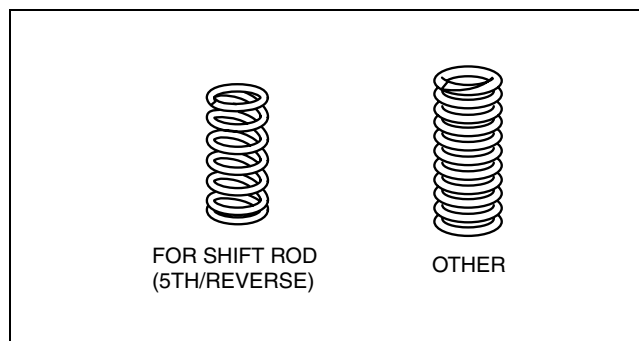
1. Remove the clip and spring from the 5th/reverse shift rod.



E5U511AM5001

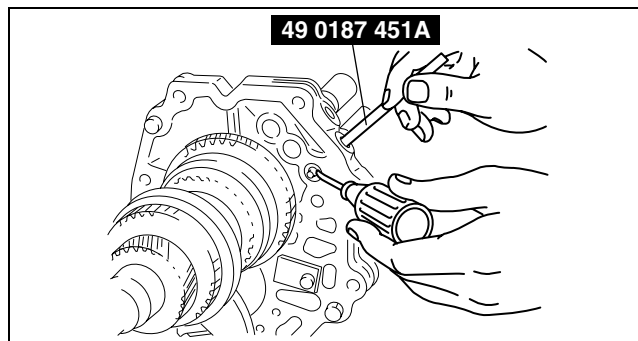
Spring and Ball Assembly Note

1. Insert the spring and ball (5th/reverse) into the bearing housing.



E5U511AM5002

2. Press down the spring and ball (5th/reverse) using the **SST** and a screwdriver, and install the shift rod.

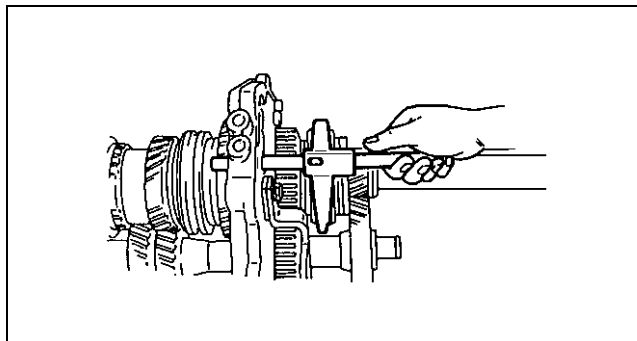


E5U511AM5003

05-11

5th/reverse Shift Fork and Rod Assembly Note

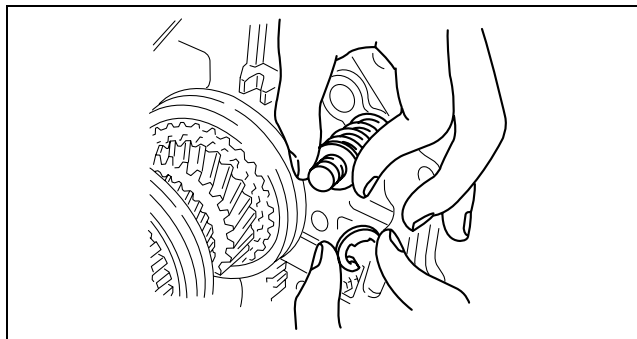
1. Install the 5th/reverse shift fork and 5th/reverse shift rod into the bearing housing.



E5U511AM5004

Spring, Clip Assembly Note

1. Slide the spring onto the 5th/reverse shift rod. While pressing the spring, install a new clip.

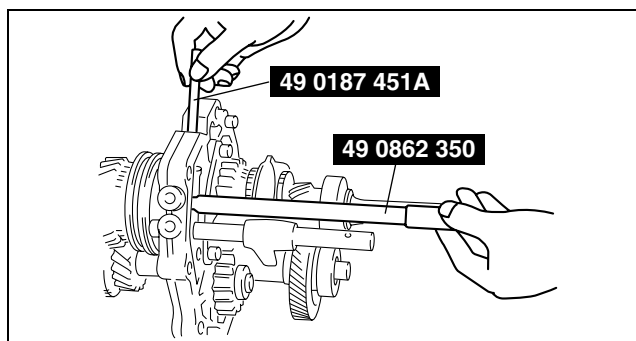


E5U511AM5041

MANUAL TRANSMISSION

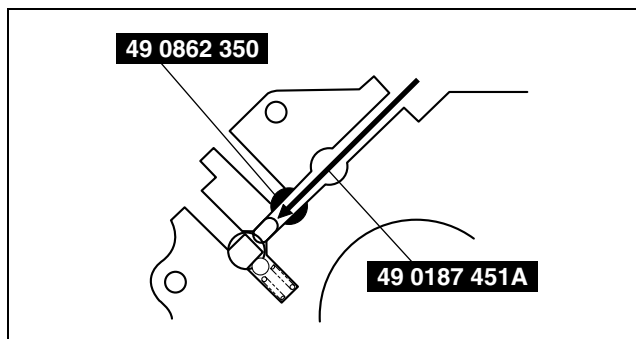
Interlock Pin Assembly Note

1. Position the interlock pin into the bearing housing using the **SSTs**.



E5U511AM5005

2. Verify that the interlock pin is correctly installed.



E5U511AM5006

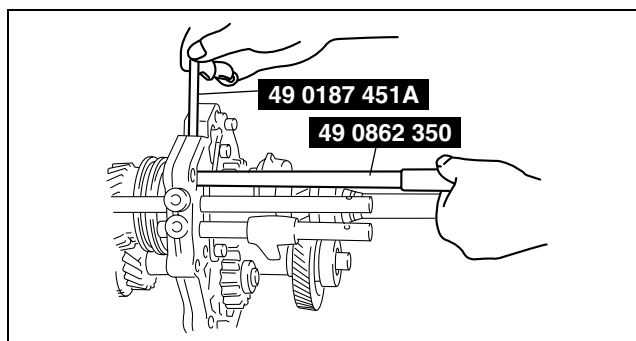
1st/2nd Shift Fork and Rod, 3rd/4th Shift Fork and Rod, and Interlock Pin Assembly Note

1. Set the 1st/2nd shift fork onto the 1st/2nd clutch hub component.
2. Install the 3rd/4th shift fork and 3rd/4th shift rod, and install the interlock pin into the bearing housing as described in the interlock pin assembly note. (See 05–11–10 Interlock Pin Assembly Note.)
3. Install the spring, ball and new washer, then tighten the cap plug.

Tightening torque

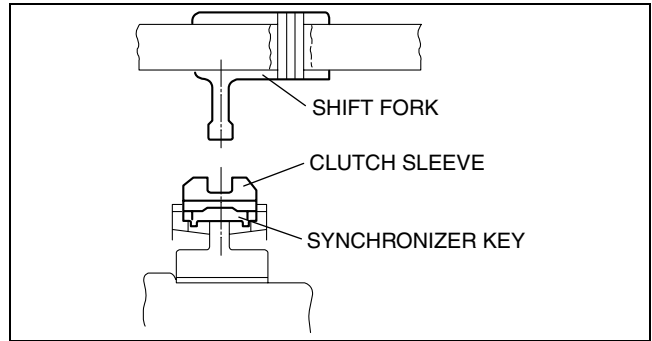
19—25 N·m {2.0—2.5 kgf·m, 14—18 ft·lbf}

4. Install the roll pin.



E5U511AM5007

- Verify that the centers of the shift fork and clutch hub sleeve are aligned properly. If they are not, select the proper washer to install between 1st gear and the mainshaft front bearing, and between reverse gear and the mainshaft front bearing.



E5U511AM5008

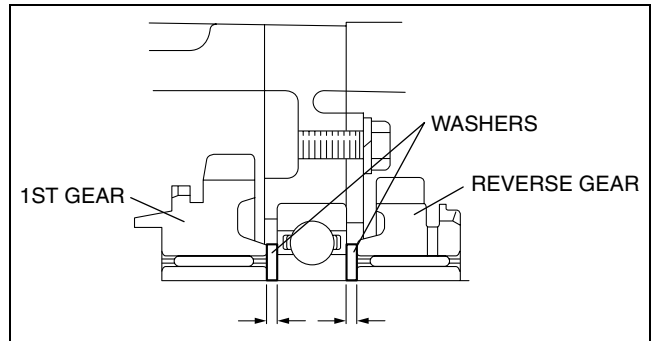
- The following washer thicknesses are available. The total thickness of the front and rear washers should be as follows.

Total thickness

5.9—6.0 mm {0.232—0.236 in}

Washer thickness

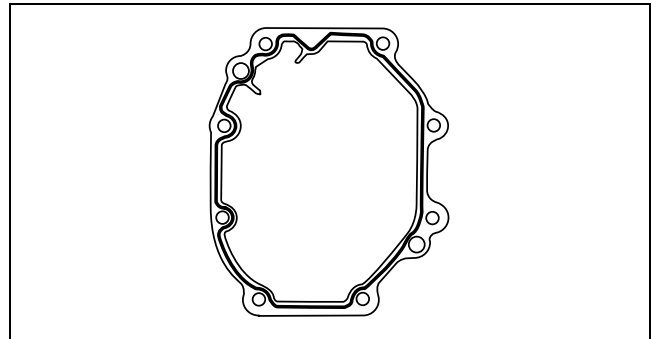
2.2 mm {0.087 in}, 2.7 mm {0.106 in}, 3.0 mm {0.118 in}, 3.2 mm {0.126 in}, 3.7 mm {0.146 in}



E5U511AM5009

Intermediate Housing Assembly Note

- Apply sealant to the contact surfaces of the intermediate housing and bearing housing as shown in the figure.
- Mount the intermediate housing to the bearing housing by tapping it lightly with a plastic hammer.



E5U511AM5052

SHIFT FORK AND SHIFT ROD PARTS INSPECTION

Springs Inspection

- Measure the free length of the springs.

Shift rod (5th/reverse) spring free length

76.5 mm {3.012 in}

Detent ball springs (5th/reverse) free length

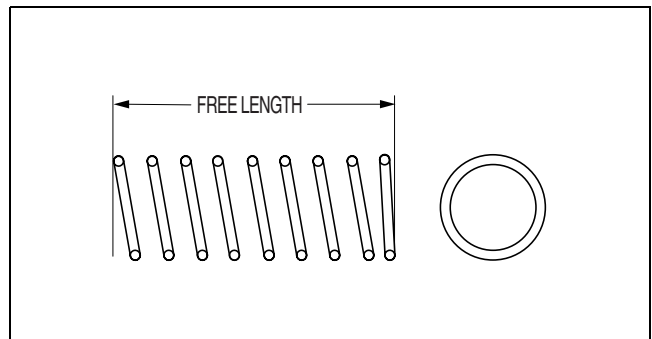
Upper: 17.0 mm {0.669 in}

Lower: 17.0 mm {0.669 in}

Detent ball spring (3rd/4th, 1st/2nd) free length

17.03 mm {0.670 in}

- If not as specified, replace the springs.



E5U511AM5010

MANUAL TRANSMISSION

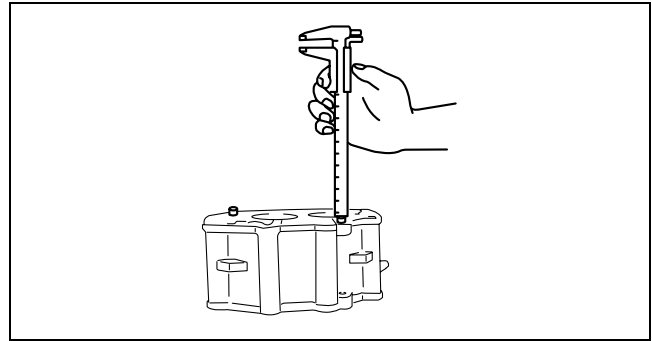
Intermediate Housing Inspection

1. Measure the intermediate housing pin height.

Standard height

9.0—10.0 mm {0.355—0.393 in}

- If not as specified, replace the intermediate housing.



E5U511AM5011

1st/2nd, 3rd/4th and 5th/reverse Shift Fork Inspection

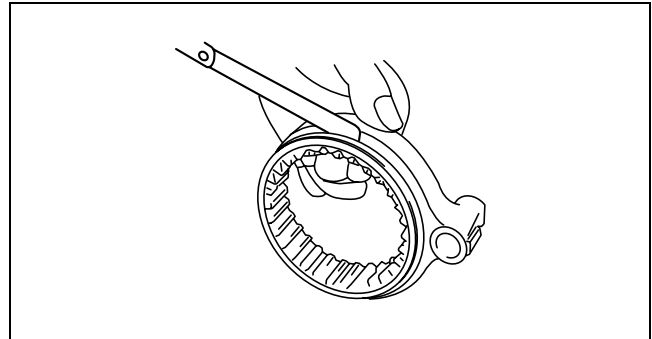
1. Measure the clearance between the hub sleeve and shift fork.

Clearance between the hub sleeve and shift fork

Standard clearance: 0.2—0.3 mm {0.008—0.012 in}

Maximum: 0.5 mm {0.020 in}

- If not as specified, replace the hub sleeve and shift fork.



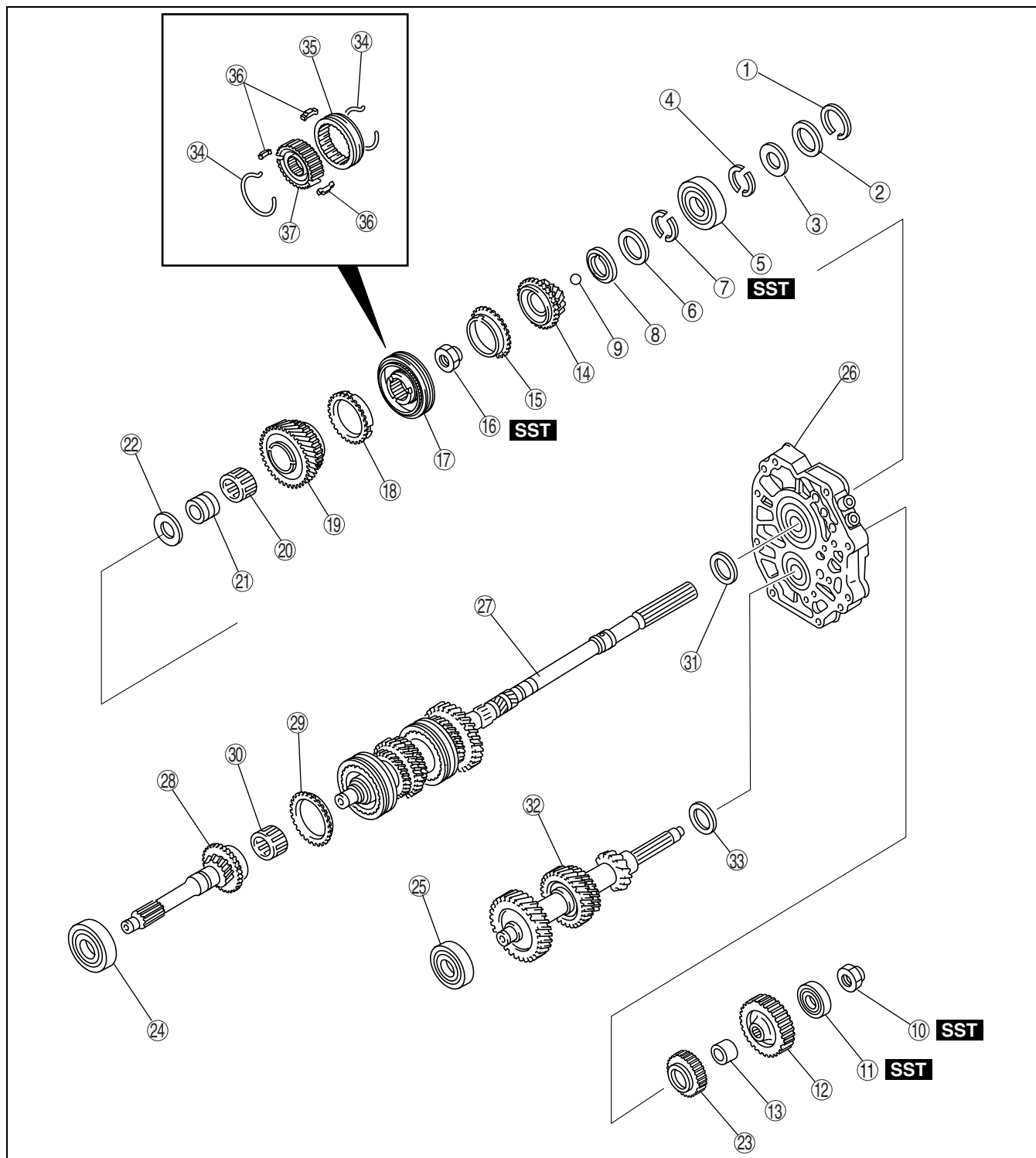
BHJ0511M018

MANUAL TRANSMISSION

MAINSHAFT AND COUNTERSHAFT PARTS DISASSEMBLY

E5U051117051M01

1. Disassemble in the order indicated in the table.



E5U511AM5042

1	Snap ring
2	Washer
3	Retaining ring
4	C-washer
5	Mainshaft rear bearing (See 05-11-14 Mainshaft Rear Bearing Disassembly Note.)
6	Retaining ring

7	C-washer
8	Thrust lock washer
9	Steel ball
10	Locknut (countershaft) (See 05-11-15 Locknut (Countershaft) Disassembly Note.)
11	Countershaft rear bearing (See 05-11-15 Countershaft Rear Bearing Disassembly Note.)

05-11

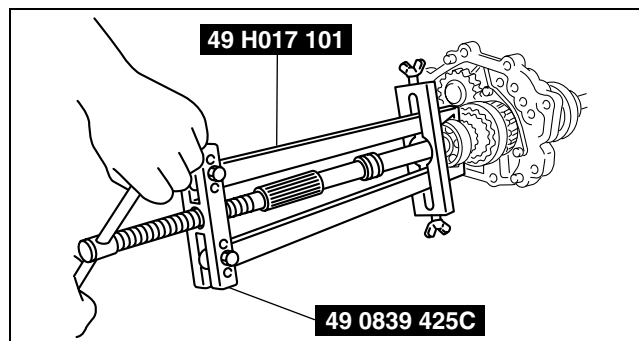
MANUAL TRANSMISSION

12	Counter 5th gear
13	Spacer
14	5th gear
15	5th synchronizer ring
16	Locknut (Mainshaft) (See 05–11–15 Locknut (Mainshaft) Disassembly Note.)
17	Clutch hub component (5th/reverse)
18	Reverse synchronizer ring
19	Reverse gear
20	Bearing
21	Bearing race
22	Washer
23	Counter reverse gear
24	Main drive gear bearing (See 05–11–16 Main Drive Gear Bearing Disassembly Note.)

25	Countershaft front bearing (See 05–11–16 Countershaft Front Bearing Disassembly Note.)
26	Bearing housing component (See 05–11–16 Bearing Housing Component Disassembly Note.)
27	Mainshaft gear component
28	Main drive gear
29	4th synchronizer ring
30	Bearing
31	Washer
32	Countershaft
33	Spacer
34	Synchronizer key spring
35	Clutch hub sleeve
36	Synchronizer key
37	Clutch hub

Mainshaft Rear Bearing Disassembly Note

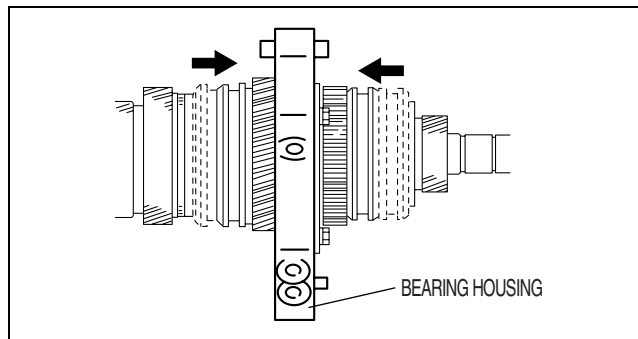
1. Remove the mainshaft rear bearing using the SSTs.



E5U511AM5012

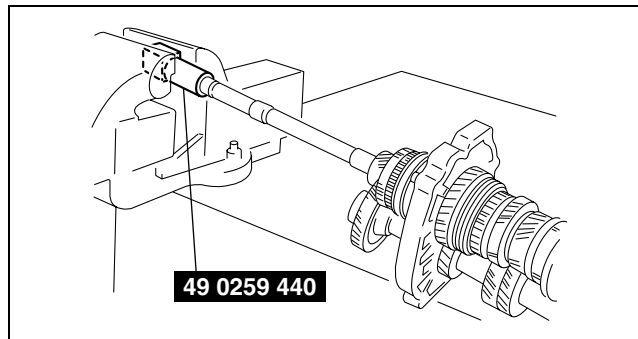
Locknut (Countershaft) Disassembly Note

1. Shift the clutch hub sleeves into 1st and reverse gears to lock the rotation of the mainshaft.
2. Use a suitable tool to uncrimp the tabs of the locknut.
3. Connect the **SST** to the mainshaft and secure it in a vise.



E5U511AM5013

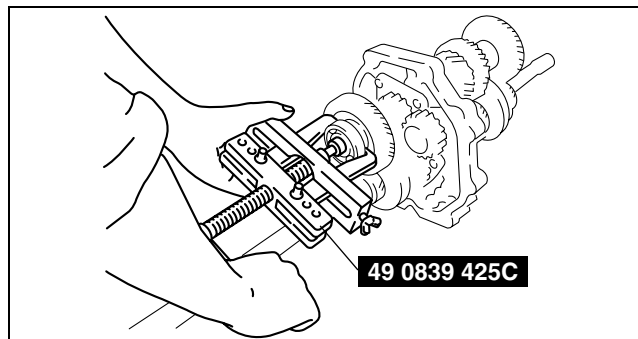
4. Remove the locknut.



E5U511AM5014

Countershaft Rear Bearing Disassembly Note

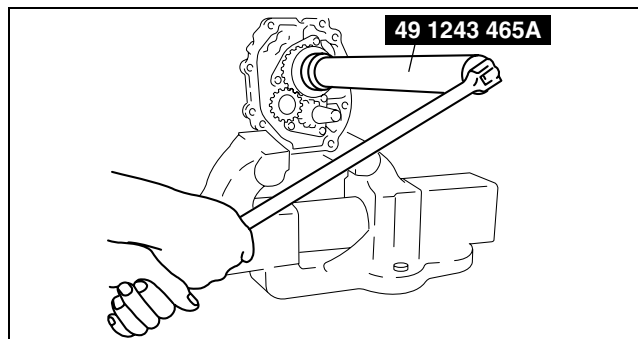
1. Remove the countershaft rear bearing using the **SST**.



E5U511AM5015

Locknut (Mainshaft) Disassembly Note

1. Shift the clutch hub sleeves into 1st and reverse gears to lock the rotation of the mainshaft.
2. Use a suitable tool to uncrimp the tabs of the locknut.
3. Secure the bearing housing in a vise.
4. Remove the locknut using the **SST**.



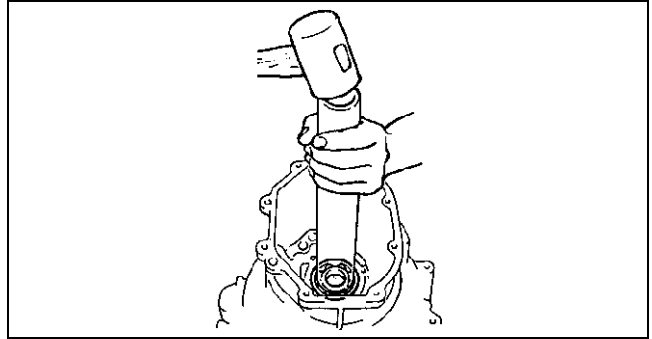
E5U511AM5016

MANUAL TRANSMISSION

Main Drive Gear Bearing Disassembly Note

1. Remove the main drive gear bearing with a pipe and a hammer.

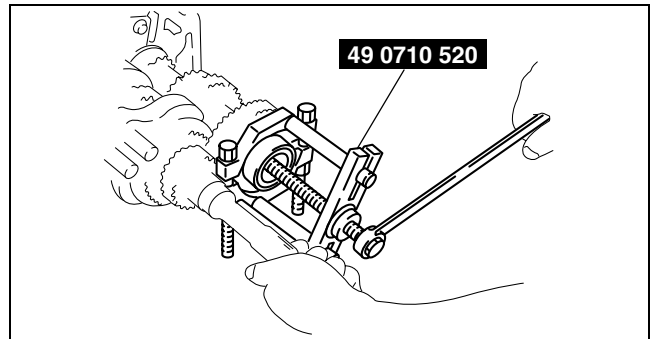
Outer diameter of pipe
70.0 mm {2.76 in}



E5U511AM5017

Countershaft Front Bearing Disassembly Note

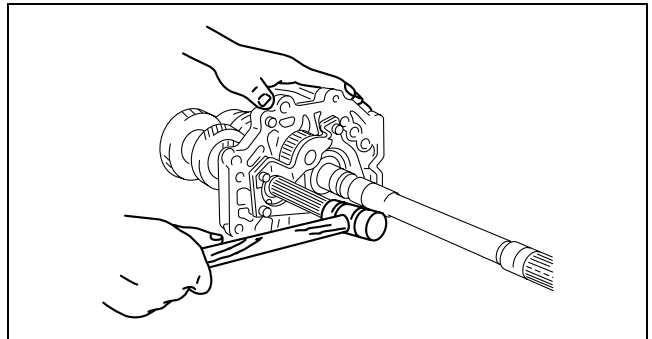
1. Remove the countershaft front bearing using the SST.



E5U511AM5018

Bearing Housing Component Disassembly Note

1. Remove the bearing housing by lightly tapping the countershaft with a copper hammer.



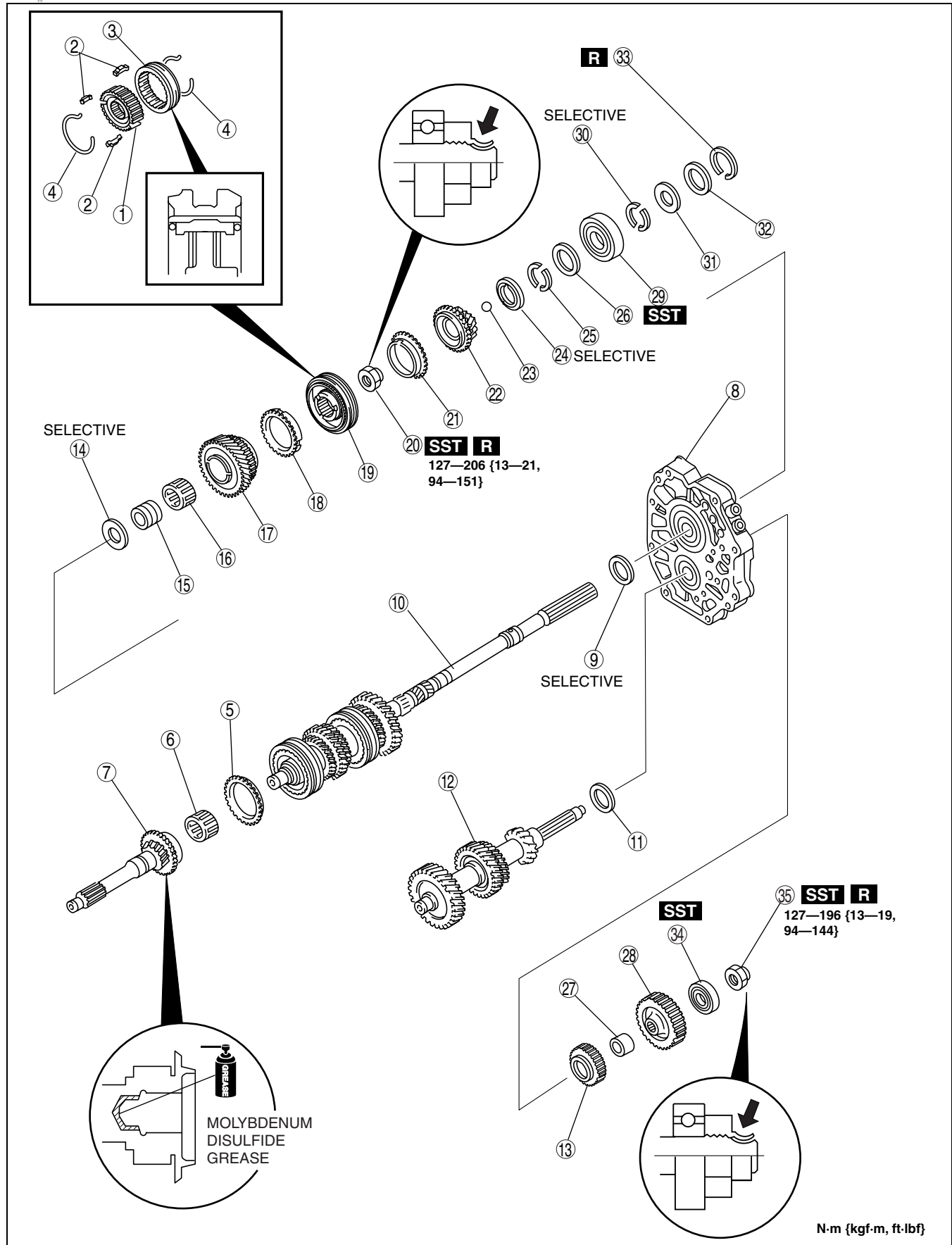
E5U511AM5019

MAINSHAFT AND COUNTERSHAFT PARTS ASSEMBLY

E5U051117051M02

1. Assemble in the order indicated in the table.

05-11



E5U511AM5043

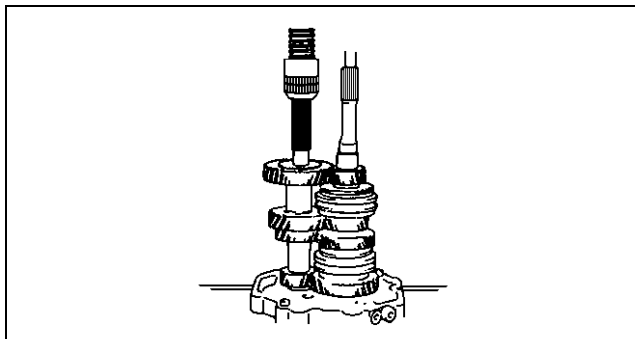
MANUAL TRANSMISSION

1	Clutch hub
2	Synchronizer key
3	Clutch hub sleeve
4	Synchronizer key springs
5	4th synchronizer ring
6	Bearing
7	Main drive gear
8	Bearing housing component
9	Washer
10	Mainshaft gear component (See 05-11-18 Mainshaft Gear Component and Countershaft Assembly Note.)
11	Spacer
12	Countershaft (See 05-11-18 Mainshaft Gear Component and Countershaft Assembly Note.)
13	Counter reverse gear
14	Washer
15	Bearing race
16	Bearing
17	Reverse gear
18	Reverse synchronizer ring
19	Clutch hub component (5th/reverse)

20	Locknut (Mainshaft) (See 05-11-18 Locknut (Mainshaft) Assembly Note.)
21	5th synchronizer ring
22	5th gear
23	Steel ball
24	Thrust lock washer (See 05-11-19 Thrust Lock Washer Assembly Note.)
25	C-washer
26	Retaining ring
27	Spacer
28	Counter 5th gear
29	Mainshaft rear bearing (See 05-11-19 Mainshaft Rear Bearing Assembly Note.)
30	C-washer
31	Retaining ring
32	Washer
33	Snap ring
34	Countershaft rear bearing (See 05-11-20 Countershaft Rear Bearing Assembly Note.)
35	Locknut (Countershaft) (See 05-11-20 Locknut (Countershaft) Assembly Note.)

Mainshaft Gear Component and Countershaft Assembly Note

1. Place the mainshaft gear component and the countershaft on the bearing housing.
2. Use a bar to press in the countershaft.



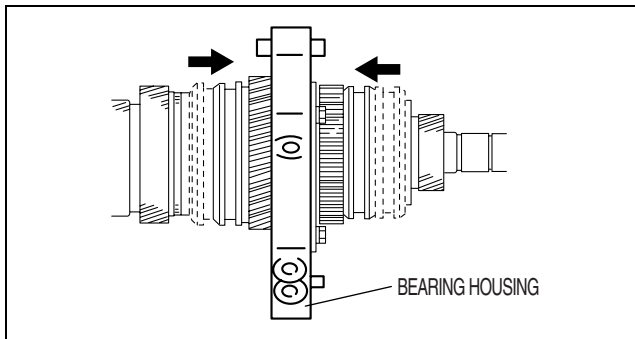
E5U511AM5020

Locknut (Mainshaft) Assembly Note

1. Secure the bearing housing component in a vise.
2. Shift the clutch hub sleeves into 1st and reverse gears to lock the rotation of the mainshaft.
3. Install a new locknut and tighten it using the SST.

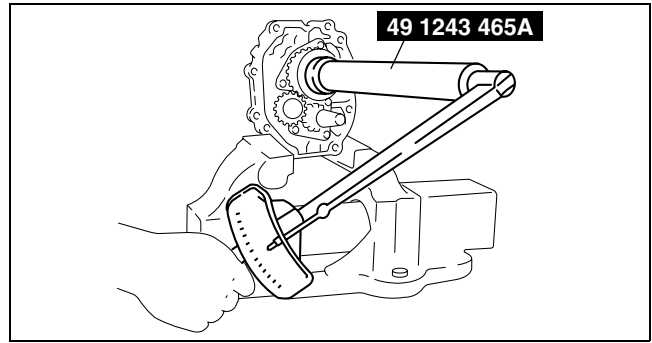
Tightening torque

127—206 N·m {13—21kgf·m, 94—151 ft·lbf}



E5U511AM5013

4. Use a chisel to stake the locknut.



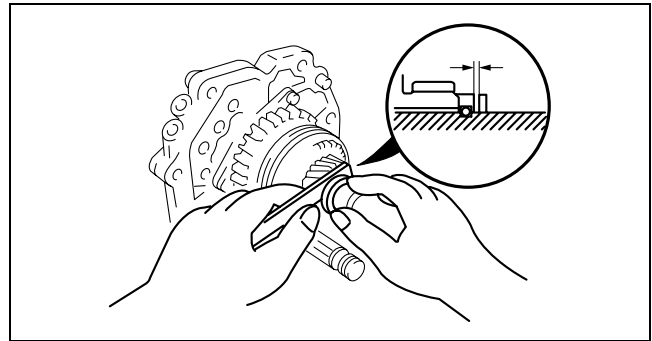
05-11

Thrust Lock Washer Assembly Note

1. Install the synchronizer ring and 5th gear.
2. Insert the steel ball and thrust lock washer.
3. Install two **3.0 mm {0.118 in}** thick C-washers in the front mainshaft groove.
4. Push the C-washers fully toward 5th gear and measure the clearance between the thrust lock washer and C-washers. If the clearance is not as specified, select the proper thrust lock washer.

Clearance between thrust lock washer and C-washer
0.1—0.3 mm {0.004—0.012 in}

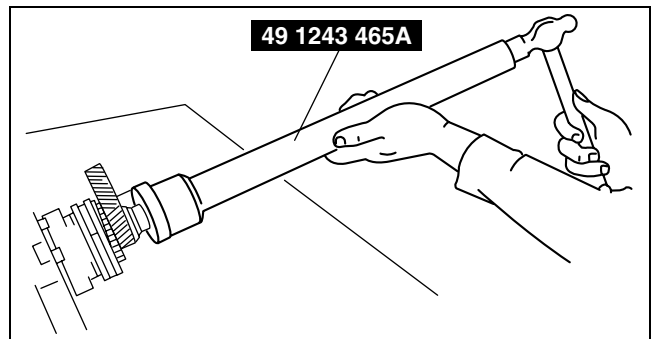
Thrust lock washer thickness
6.2 mm {0.244 in}, 6.4 mm {0.252 in}, 6.5 mm {0.256 in}, 6.6 mm {0.260 in}



5. Install the retaining ring.

Mainshaft Rear Bearing Assembly Note

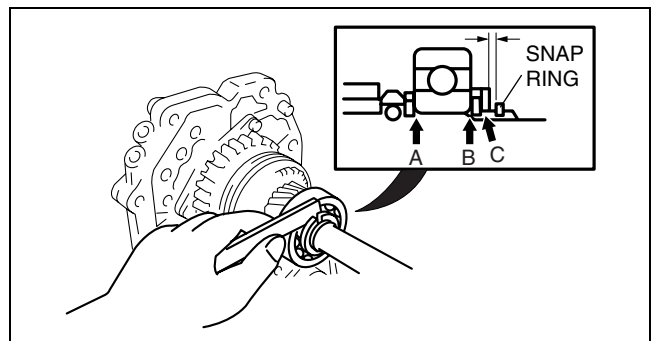
1. Install the mainshaft rear bearing using the SST, and fully seat it against the front C-washers.
2. Install the original C-washers and hold them with the retaining ring.
3. Install the washer and new snap ring.
4. If the C-washers do not fit into the rear mainshaft groove, select the proper thickness C-washers.
5. Verify that C-washers installed at one position are of the same thickness.



6. With points A through C pressed tightly together, measure the clearance between the washer and snap ring. If the clearance is not as specified, select the proper C-washers.

Clearance between washer and snap ring
0—0.1 mm {0—0.004 in}

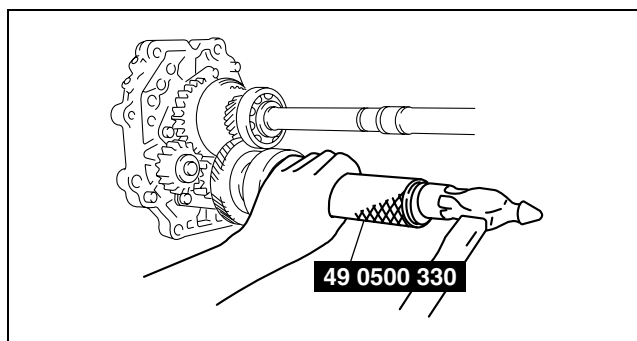
C-washer thickness
2.9 mm {0.114 in}, 3.0mm {0.118 in}, 3.1mm {0.122 in}



MANUAL TRANSMISSION

Countershaft Rear Bearing Assembly Note

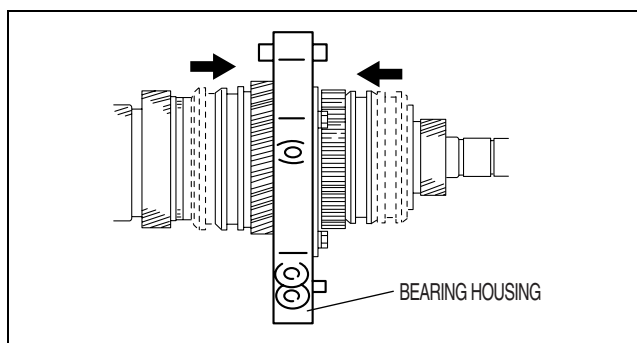
1. Install the countershaft rear bearing onto the countershaft using the **SST**.



E5U511AM5023

Locknut (Countershaft) Assembly Note

1. Shift the clutch hub sleeves into 1st and reverse gears to lock the rotation of the mainshaft.
2. Connect the **SST** to the mainshaft and secure it in a vise.



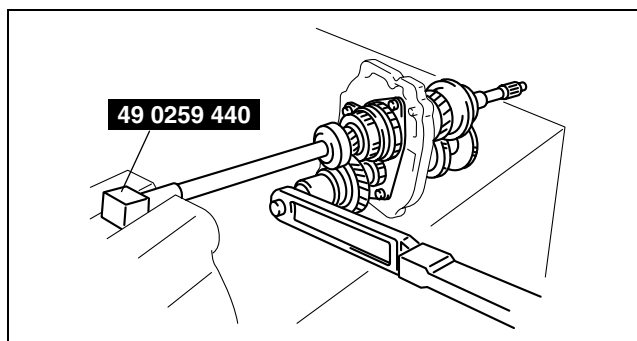
E5U511AM5013

3. Install a new locknut and tighten it.

Tightening torque

127—196 N·m {13—19 kgf·m, 94—144 ft·lbf}

4. Use a chisel to stake the locknut.



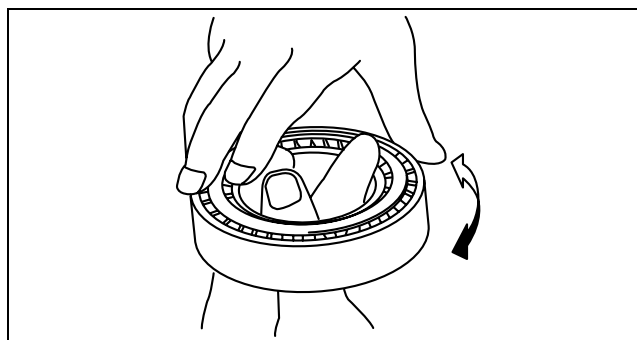
E5U511AM5024

MAINSHAFT AND COUNTERSHAFT PARTS INSPECTION

E5U051117051M03

Bearing Inspection

1. Inspect for damage and rough rotation.



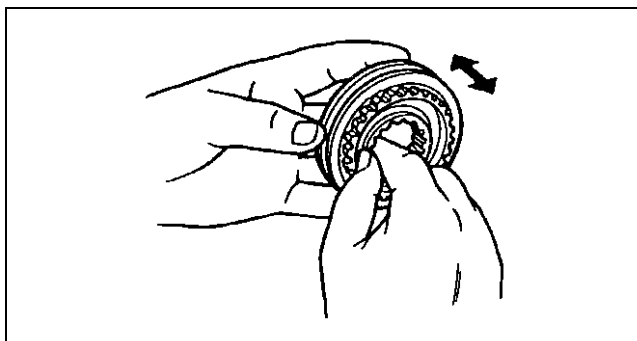
E6U515ZMC097

Each Gear and Main Drive Gear Inspection

1. Inspect the following, and replace the each gear and main drive gear if necessary.
 - Synchronizer cones for wear.
 - Individual gear teeth for damage, wear, and cracks.
 - Synchronizer ring matching teeth for damage and wear.
 - Main drive gear splines for damage and wear.

Clutch Hub Component Inspection

1. Inspect the following, and replace the clutch hub component if necessary.
 - Clutch hub sleeve and hub operation.
 - Individual gear teeth for damage, wear, and cracks.
 - Synchronizer keys for damage, wear, and cracks.



E5U511AM5025

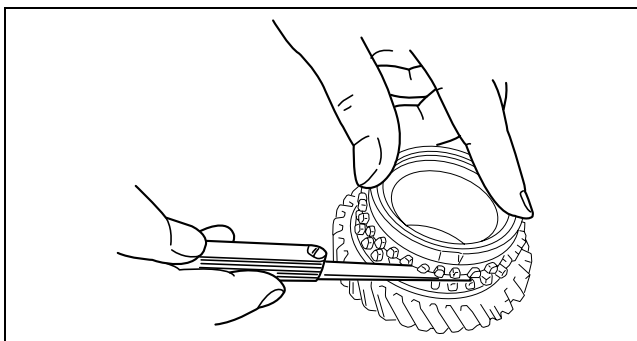
05-11

Synchronizer Ring (4th, 5th and reverse) Inspection

1. Inspect the following, and replace the synchronizer ring if necessary.
 - Individual synchronizer ring teeth for wear and cracks.
 - The tapered surface for wear and cracks.
2. Set the synchronizer ring squarely in the gear.
3. Measure the clearance between the synchronizer ring and flank surface of gear all around the circumference.

Clearance between the synchronizer ring (4th, 5th and reverse) and flank surface
Standard clearance: 1.5 mm {0.059 in}
Minimum: 0.8 mm {0.031 in}

- If not as specified, replace the synchronizer ring.



BHJ0511M088

Countershaft Inspection

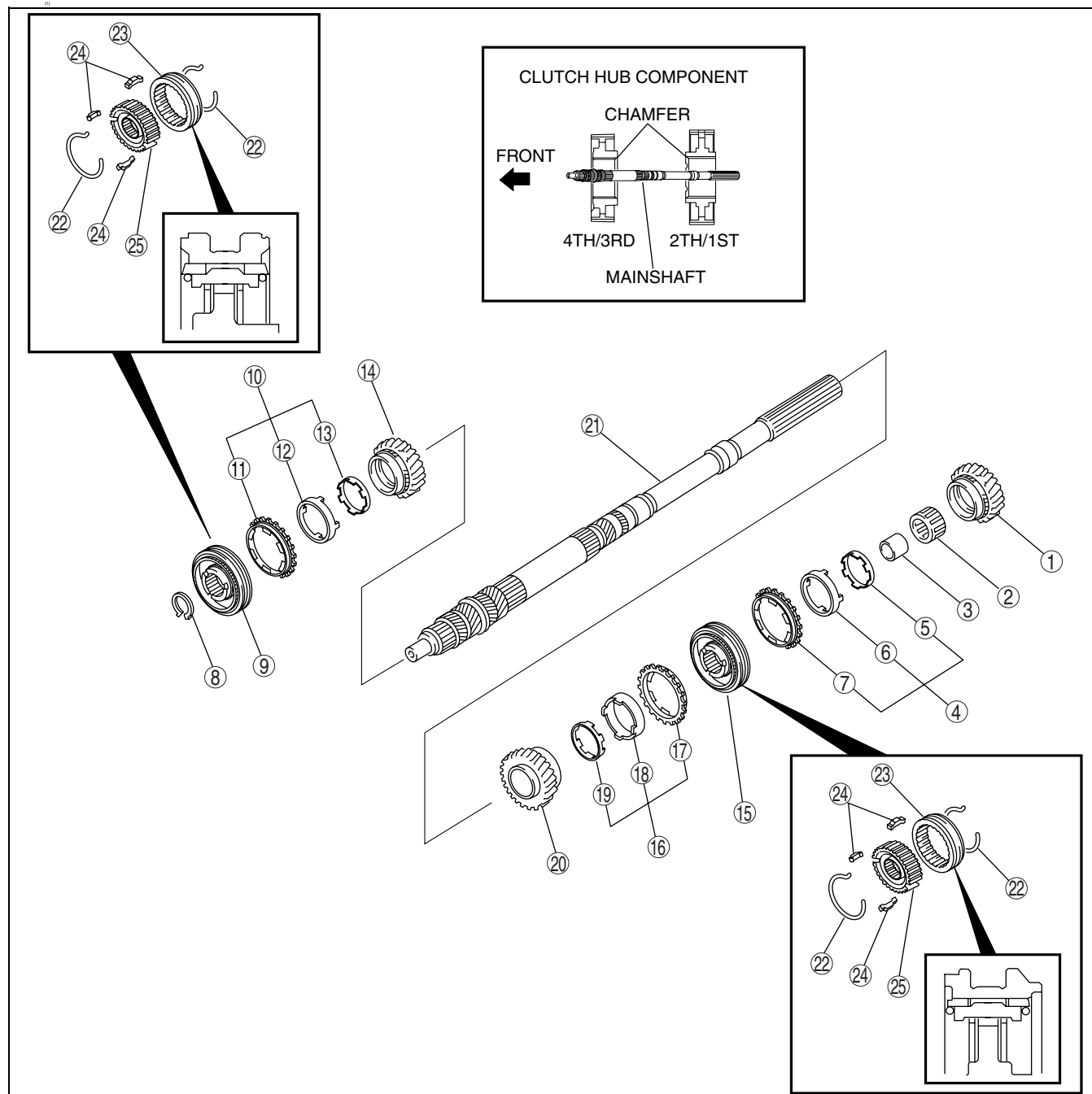
1. Inspect the following, and replace the countershaft if necessary.
 - Gear teeth for damage, wear, and cracks.
 - Splines for damage and wear.

MANUAL TRANSMISSION

MAINSHAFT PARTS DISASSEMBLY/ASSEMBLY

E5U051117051M04

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



E5U511AM5046

1	1st gear
2	Bearing
3	Bearing race
4	1st synchronizer component (See 05-11-24 1st, 2nd and 3rd synchronizer component Assembly Note.)
5	Inner cone
6	Double cone
7	1st synchronizer ring
8	Snap ring

9	3rd/4th clutch hub component (See 05-11-23 3rd/4th Clutch Hub Component Disassembly Note.) (See 05-11-24 1st/2nd and 3rd/4th Clutch Hub Component Assembly Note.)
10	3rd synchronizer component (See 05-11-24 1st, 2nd and 3rd synchronizer component Assembly Note.)
11	3rd synchronizer ring
12	Double cone
13	Inner cone
14	3rd gear

MANUAL TRANSMISSION

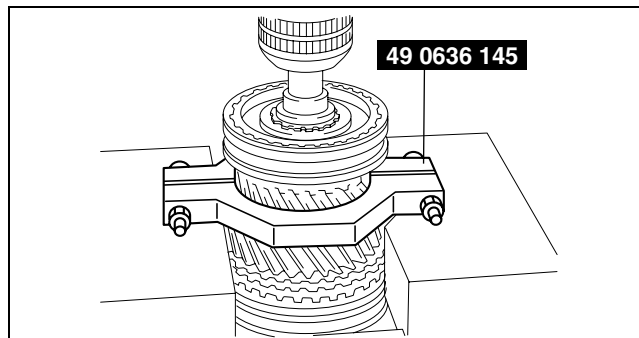
15	1st/2nd clutch hub component (See 05-11-23 1st/2nd Clutch Hub Component Disassembly Note.) (See 05-11-24 1st/2nd and 3rd/4th Clutch Hub Component Assembly Note.)
16	2nd synchronizer component (See 05-11-24 1st, 2nd and 3rd synchronizer component Assembly Note.)
17	2nd synchronizer ring
18	Double cone
19	Inner cone

20	2nd gear
21	Mainshaft
22	Synchronizer key springs
23	Clutch hub sleeve
24	Synchronizer key
25	Clutch hub

05-11

3rd/4th Clutch Hub Component Disassembly Note

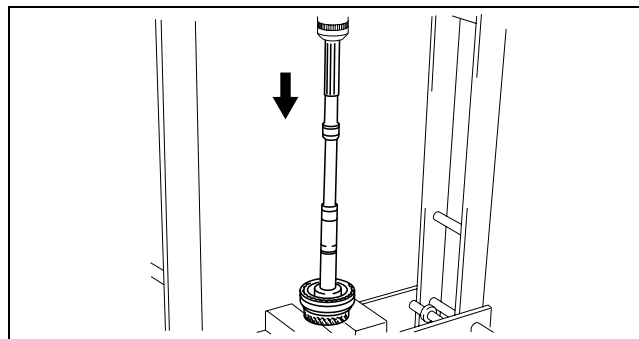
1. Position the **SST** between 2nd and 3rd gears, and hold the mainshaft from underneath.
2. Press the mainshaft out of the 3rd/4th clutch hub component and 3rd gear.



BHJ0511M078

1st/2nd Clutch Hub Component Disassembly Note

1. Hold the mainshaft, and press the 1st/2nd clutch hub component, 2nd synchronizer component, and 2nd gear from the mainshaft.

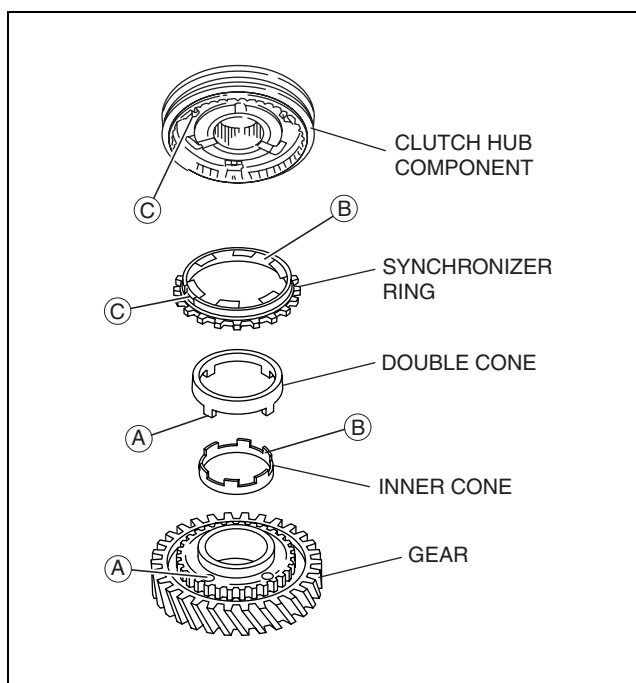


BHJ0511M079

MANUAL TRANSMISSION

1st, 2nd and 3rd synchronizer component Assembly Note

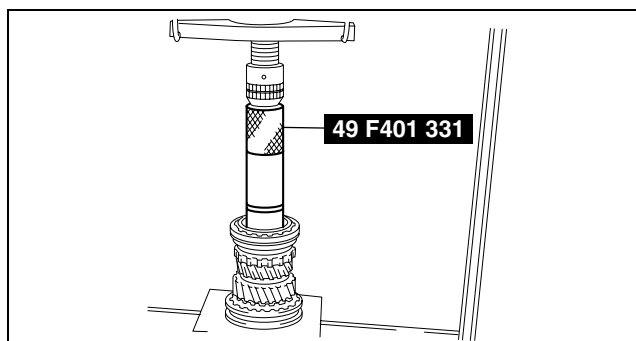
1. Securely align the tabs on each ring of the gear side with the installation hole of the 3rd gear and the key groove of the clutch hub.



E5U511AM5054

1st/2nd and 3rd/4th Clutch Hub Component Assembly Note

1. Set the 2nd gear, 2nd synchronizer component, and 1st/2nd clutch hub component on the mainshaft, then press in the mainshaft.
2. Set the 3rd gear, 3rd synchronizer component, and 3rd/4th clutch hub component on the mainshaft, then press them onto the mainshaft using the **SST**.
3. Install a new snap ring on the front of the mainshaft.
4. Install the 1st synchronizer component, bearing race, bearing, and 1st gear.



BHJ0511M099

MAINSHAFT PARTS INSPECTION

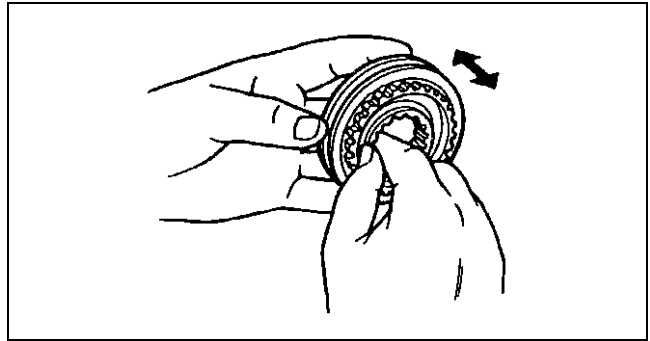
Each Gear Inspection

1. Inspect the following, and replace each gear if necessary.
 - Synchronizer cones for wear.
 - Individual gear teeth for damage, wear, and cracks.
 - Synchronizer ring matching teeth for damage and wear.
 - Main drive gear splines for damage and wear.

E5U051117051M05

Clutch Hub Component Inspection

1. Inspect the following, and replace the clutch hub component if necessary.
 - Clutch hub operation.
 - Individual gear teeth for damage, wear, and cracks.



E5U511AM5025

05-11

Synchronizer Component (1st, 2nd and 3rd) Inspection

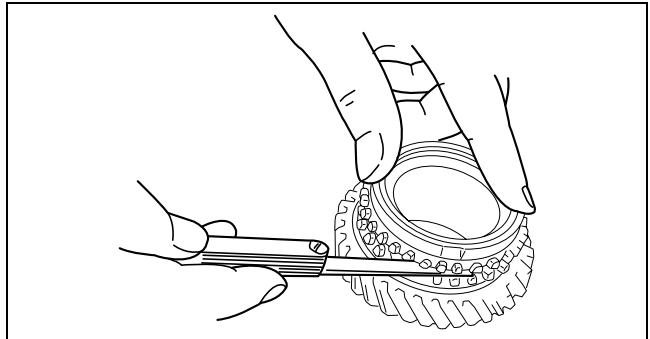
1. Inspect individual synchronizer ring gear teeth for damage, wear, and cracks. Replace the synchronizer component if any such damage is found.
2. Inspect for wear and damage to the tapered surfaces of the inner cone, double cone, and synchronizer ring. Replace the synchronizer component if any such damage is found.
3. Set the synchronizer ring squarely in the gear.
4. Measure the clearance between the synchronizer ring and the flank surface of gear all around the circumference.

Clearance between the synchronizer ring (1st, 2nd and 3rd) and flank surface

Standard clearance: 1.5 mm {0.059 in}

Minimum: 0.8 mm {0.031 in}

- If not within the specification, replace the synchronizer ring component.



BHJ0511M088

Mainshaft Inspection

1. Measure the mainshaft runout as shown.

Mainshaft runout

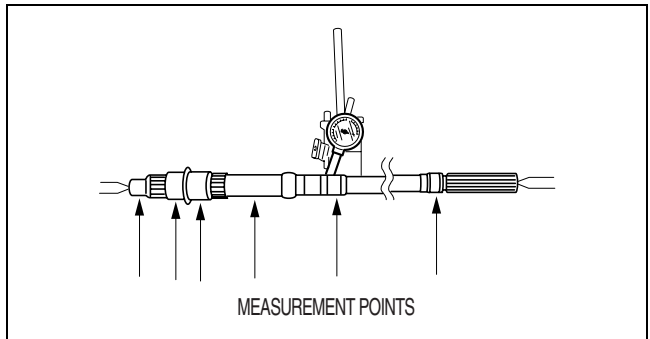
Maximum runout: 0.03 mm {0.0012 in}

- If not as specified, replace the mainshaft.
2. Inspect splines for damage or wear. Replace the mainshaft if any such damage is found.
 3. Measure the clearance between mainshaft and gear (or bushing).

Clearance between mainshaft and gear (or bushing)

Maximum clearance: 0.15 mm {0.006 in}

- If not as specified, replace the mainshaft.



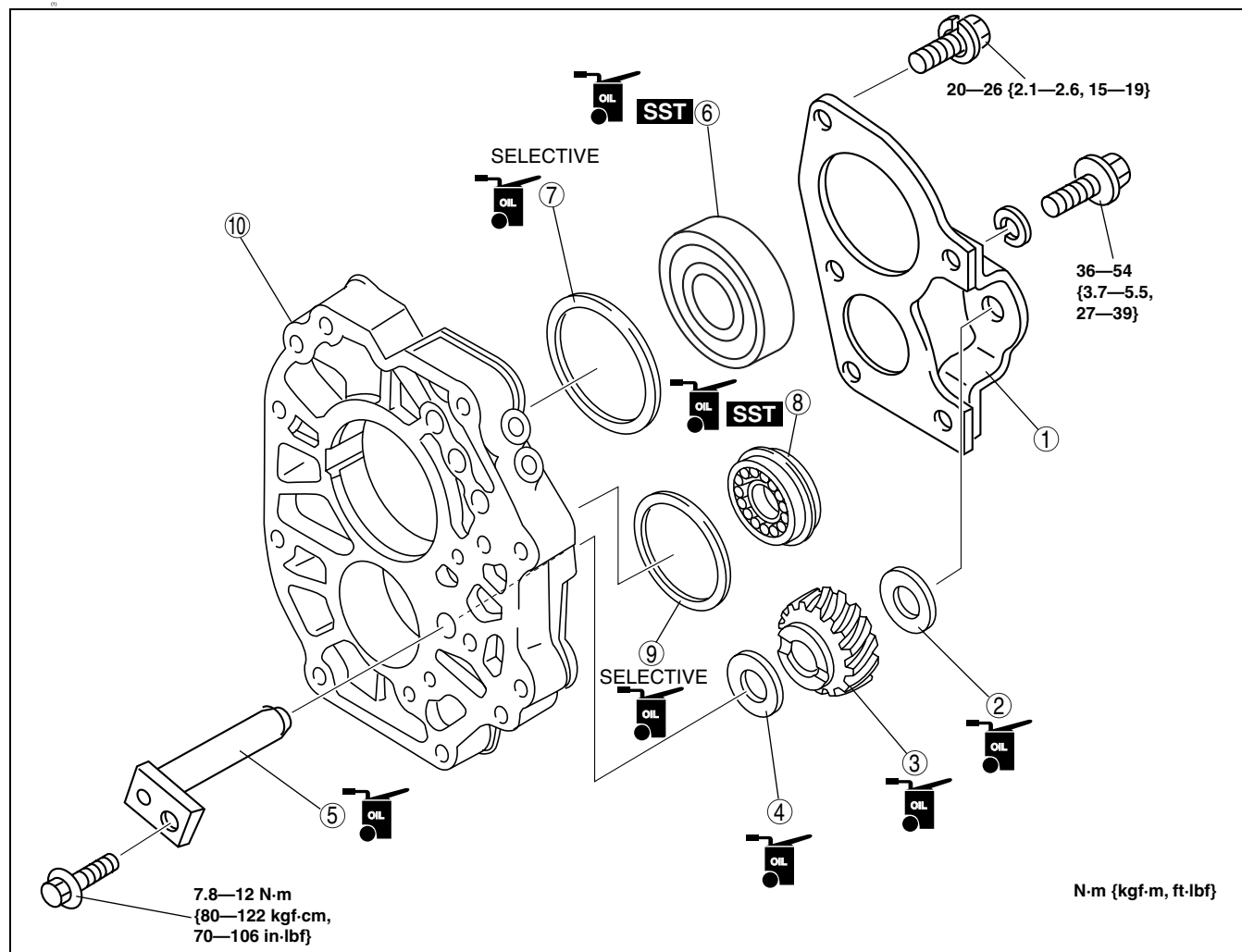
E5U511AM5026

MANUAL TRANSMISSION

BEARING HOUSING COMPONENT DISASSEMBLY/ASSEMBLY

E5U051117060M01

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



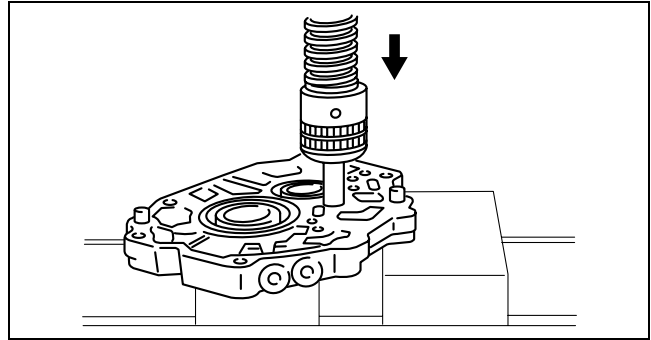
E5U511AM5047

1	Bearing cover
2	Washer
3	Reverse idler gear (See 05-11-29 Reverse Idler Gear Assembly Note.)
4	Washer
5	Reverse idler gear shaft (See 05-11-27 Reverse Idler Gear Shaft Disassembly Note.) (See 05-11-28 Reverse Idler Gear Shaft Assembly Note.)
6	Mainshaft front bearing (See 05-11-27 Mainshaft Front Bearing Disassembly Note.) (See 05-11-28 Mainshaft Front Bearing Assembly Note.)

7	Mainshaft front bearing adjustment shim (See 05-11-28 Mainshaft Front Bearing Adjustment Shim Assembly Note.)
8	Countershaft center bearing (See 05-11-27 Countershaft Center Bearing Disassembly Note.) (See 05-11-28 Countershaft Center Bearing Assembly Note.)
9	Countershaft center bearing adjustment shim (See 05-11-27 Countershaft Center Bearing Adjustment Shim Assembly Note.)
10	Bearing housing

Reverse Idler Gear Shaft Disassembly Note

1. Remove the reverse idler gear shaft installation bolt.
2. Support the reverse idler gear shaft, and press it out from the bearing housing.

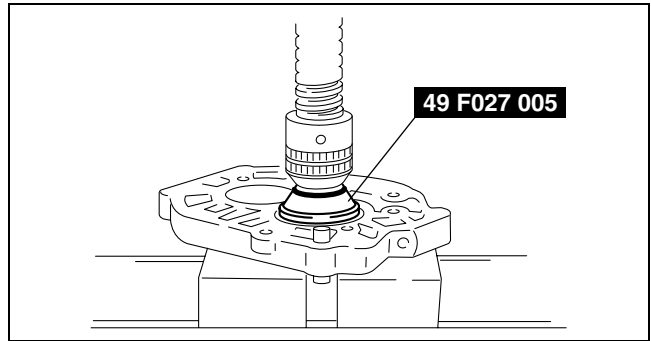


E5U511AM5027

05-11

Mainshaft Front Bearing Disassembly Note

1. Support the mainshaft front bearing, and press it out from the bearing housing using the SST.



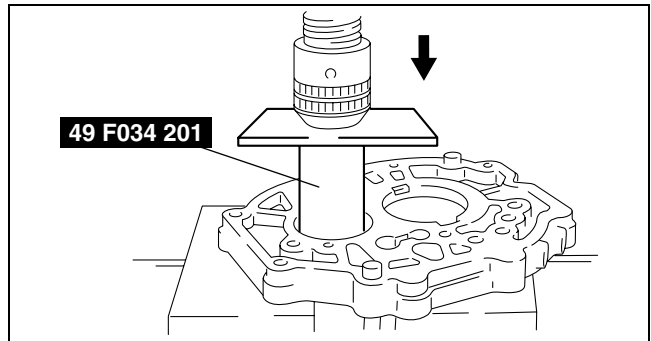
E5U511AM5028

Countershaft Center Bearing Disassembly Note

Note

- If countershaft center bearing is replaced, replace the spacer also.

1. Support the countershaft center bearing, and press it out from the bearing housing using the SST.



E5U511AM5029

Countershaft Center Bearing Adjustment Shim Assembly Note

1. Measure the clearance between the countershaft center bearing and the bearing housing. If not within the specification, adjust the clearance by installing the correct adjustment shim(s).

Clearance between countershaft center bearing and bearing housing

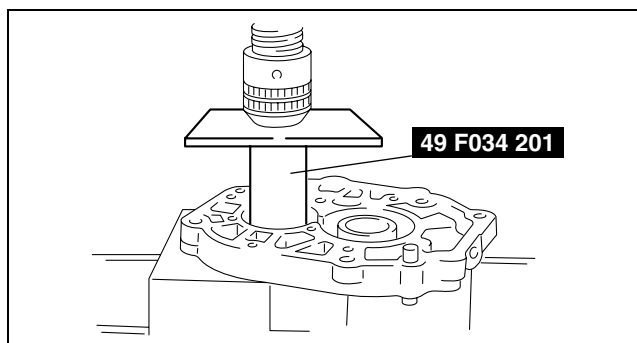
0—0.1 mm {0—0.004 in}

Countershaft center bearing adjustment shim thickness

0.1 mm {0.004 in}, 0.3 mm {0.012 in}

Countershaft Center Bearing Assembly Note

1. Press the countershaft center bearing into the bearing housing using the **SST**.



E5U511AM5030

Mainshaft Front Bearing Adjustment Shim Assembly Note

1. Measure the clearance between the mainshaft front bearing and the bearing housing. If not within the specification, adjust the clearance by installing the correct adjustment shim(s).

Clearance between mainshaft front bearing and bearing housing

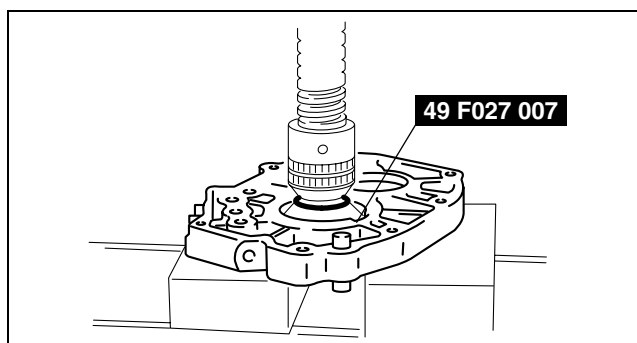
0—0.1 mm {0—0.004 in}

Mainshaft front bearing adjustment shim thickness

0.1 mm {0.004 in}, 0.3 mm {0.012 in}

Mainshaft Front Bearing Assembly Note

1. Press the mainshaft front bearing into the bearing housing using the **SST**.



E5U511AM5031

Reverse Idler Gear Shaft Assembly Note

1. Press the reverse idler gear shaft into the bearing housing.
2. Install and tighten the reverse idler gear shaft installation bolt.

Tightening torque

7.8—12 N·m {80—122 kgf·cm, 70—106 in·lbf}

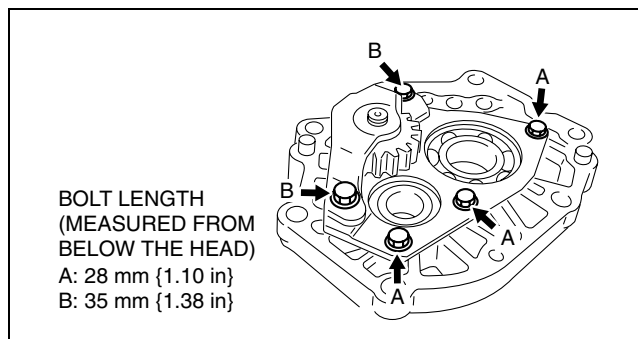
Reverse Idler Gear Assembly Note

1. Install the reverse idler gear, and washer, and bearing cover.
2. Tighten the bearing cover installation bolts.

Tightening torque

A: 20—26 N·m {2.1—2.6 kgf·m, 15—19 ft·lbf}

B: 36—54 N·m {3.7—5.5 kgf·m, 27—39 ft·lbf}



E5U511AM5032

BEARING HOUSING COMPONENT INSPECTION

Reverse Idler Gear and Shaft Inspection

1. Inspect gear teeth for wear and cracks. Replace the reverse idler gear if necessary.
2. Measure the clearance between the reverse idler gear bushing and shaft.

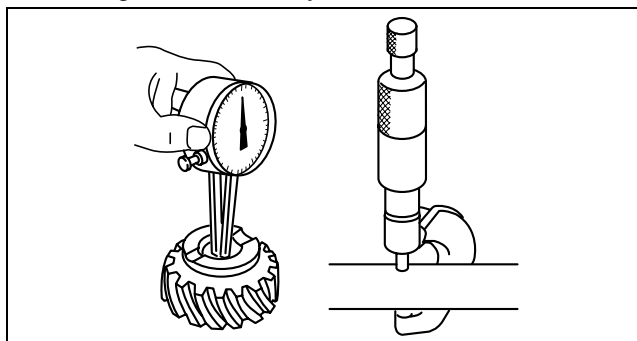
Clearance between the reverse idler gear bushing and shaft

Standard clearance: 0.02—0.05 mm

{0.0008—0.0020 in}

Maximum: 0.15 mm {0.006 in}

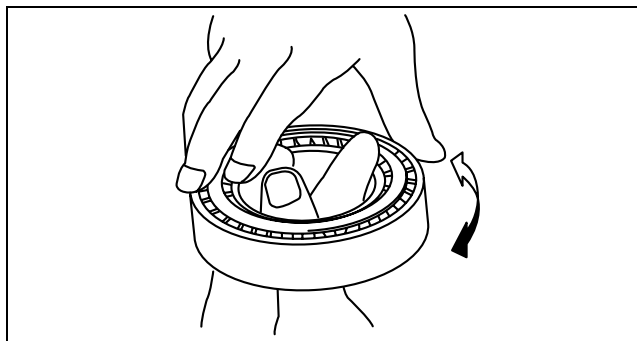
- If not as specified, replace the reverse idler gear and shaft.



E5U511AM5048

Bearing Inspection

1. Inspect for damage and rough rotation. Replace the bearing if necessary.



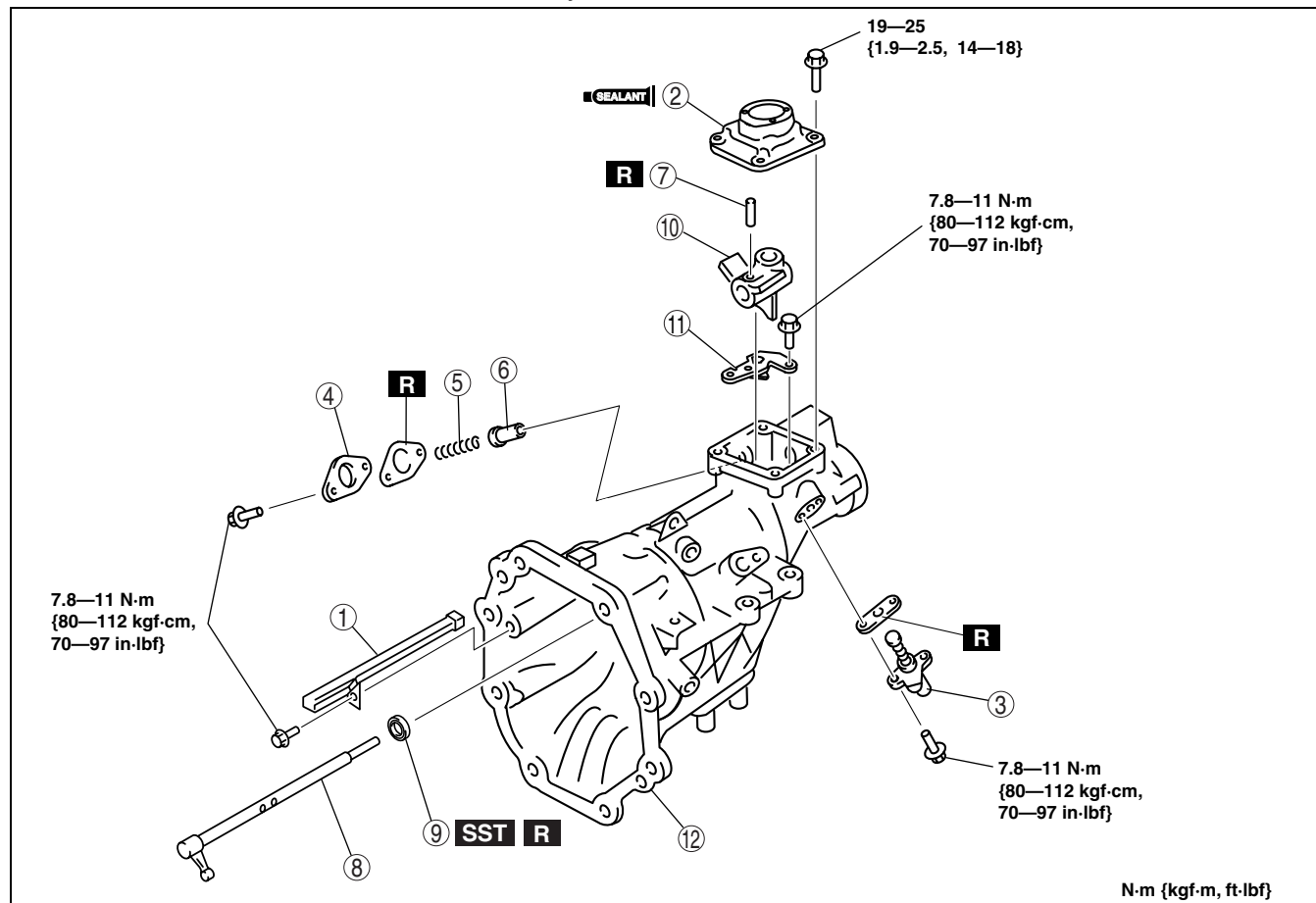
E6U515ZMC097

MANUAL TRANSMISSION

EXTENSION HOUSING PARTS DISASSEMBLY/ASSEMBLY

E5U051117011M03

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



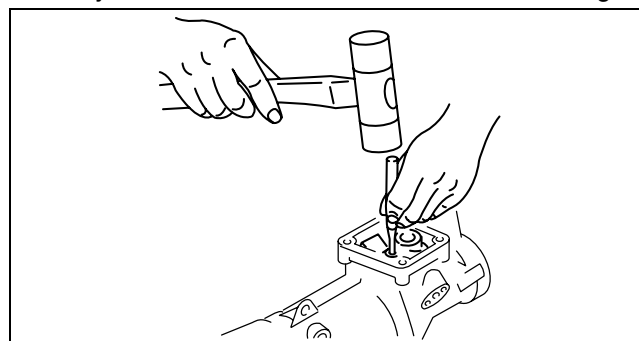
E5U511AM5049

1	Oil guide
2	Control case
3	Select spindle component
4	Spring cap
5	Select lock spindle spring
6	Select lock spindle
7	Roll pin (See 05-11-30 Roll Pin Disassembly Note.)

8	Control rod
9	Oil seal (control rod) (See 05-11-31 Oil Seal (control rod) Disassembly Note.) (See 05-11-31 Oil Seal (control rod) Assembly Note.)
10	Control rod end
11	Shift guide component
12	Extension housing

Roll Pin Disassembly Note

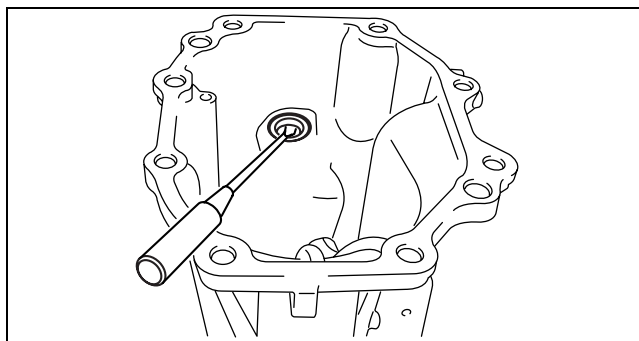
1. Slide the control rod end to the point where the roll pin is directly above the recess in the extension housing.
2. Remove the roll pin from the control rod by using a pin punch and a hammer.



E5U511AM5051

Oil Seal (control rod) Disassembly Note

1. Using a flathead screwdriver, remove the oil seal as shown in the figure.

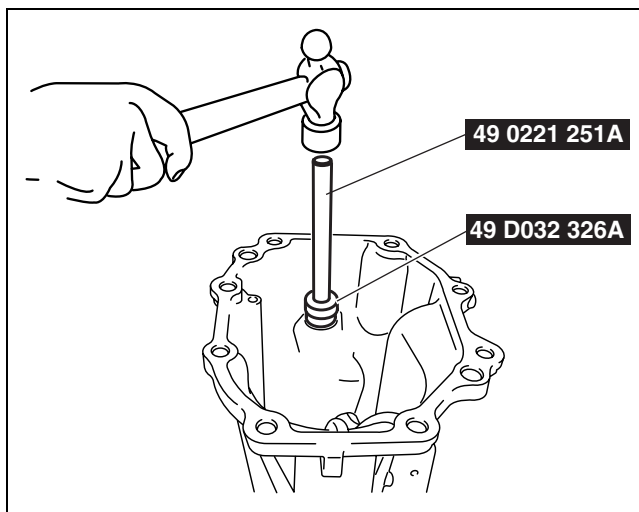


E5U511AM5058

05-11

Oil Seal (control rod) Assembly Note

1. Install the oil seal using the SST as shown in the figure.

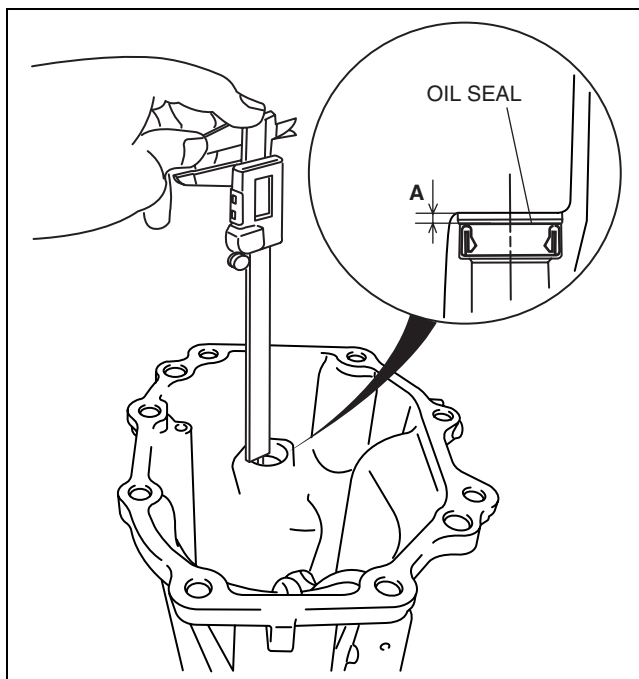


E5U511AM5059

2. Verify that the depth A dimensions are as indicated below.

Installation depth

A: 3—4 mm {0.119—0.157 in}



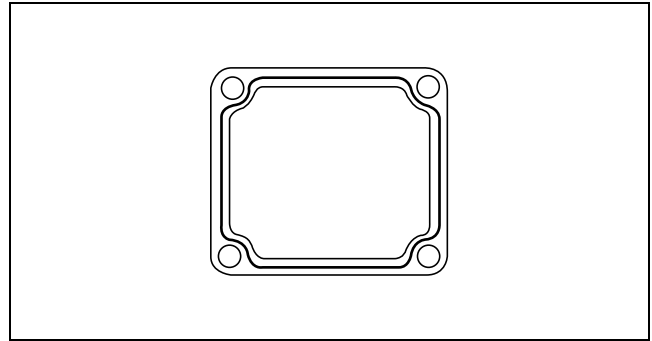
E5U511AM5060

Control case Assembly Note

1. Apply sealant to the contact surfaces of the extension housing and control case as shown in the figure.
2. Assemble the control case.

Tightening torque

19—25 N·m {1.9—2.5 kgf·m, 14—18 ft·lbf}



E5U511AM5050

05-50 TECHNICAL DATA

TRANSMISSION/TRANSAXLE. 05-50-1

TRANSMISSION/TRANSAXLE

E5U05500000M01

05-50

Item	Specification
Shift rod (5th/reverse) spring free length	76.5 mm {3.012 in}
Detent ball springs (5th/reverse) free length	Upper: 17.0 mm {0.669 in} Lower: 17.0 mm {0.669 in}
Detent ball spring (3rd/4th, 1st/2nd) free length	17.03 mm {0.670 in}
Clearance between the hub sleeve and shift fork	Standard clearance: 0.2—0.3 mm {0.008—0.012 in} Maximum: 0.5 mm {0.020 in}
Clearance between thrust lock washer and C-washer	0.1—0.3 mm {0.004—0.012 in}
Thrust lock washer thickness	6.2 mm {0.244 in}, 6.4 mm {0.252 in}, 6.5 mm {0.256 in}, 6.6 mm {0.260 in}
Clearance between washer and snap ring	0—0.1 mm {0—0.004 in}
C-washer thickness	2.9 mm {0.114 in}, 3.0mm {0.118 in}, 3.1mm {0.122 in}
Clearance between the synchronizer ring (4th, 5th and reverse) and flank surface	Standard clearance: 1.5 mm {0.059 in} Minimum: 0.8 mm {0.031 in}
Clearance between the synchronizer ring (1st, 2nd and 3rd) and flank surface	Standard clearance: 1.5 mm {0.059 in} Minimum: 0.8 mm {0.031 in}
Mainshaft runout	Maximum runout: 0.03 mm {0.0012 in}
Clearance between mainshaft and gear (or bushing)	Maximum clearance: 0.15 mm {0.006 in}
Clearance between countershaft center bearing and bearing housing	0—0.1 mm {0—0.004 in}
Countershaft center bearing adjustment shim thickness	0.1 mm {0.004 in}, 0.3 mm {0.012 in}
Clearance between mainshaft front bearing and bearing housing	0—0.1 mm {0—0.004 in}
Mainshaft front bearing adjustment shim thickness	0.1 mm {0.004 in}, 0.3 mm {0.012 in}
Clearance between the reverse idler gear bushing and shaft	Standard clearance: 0.02—0.05 mm {0.0008—0.0020 in} Maximum: 0.15 mm {0.006 in}

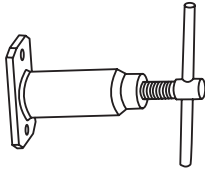
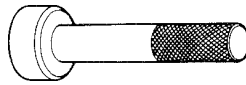
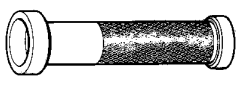

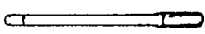
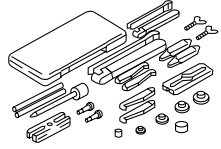
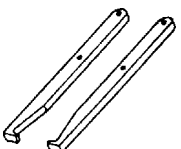

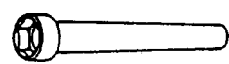
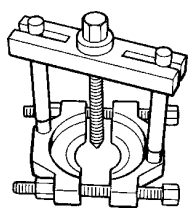
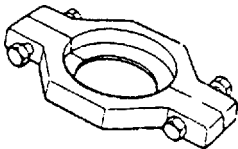
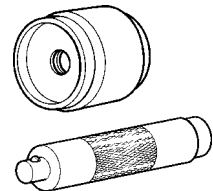
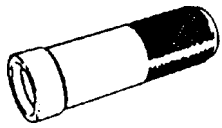
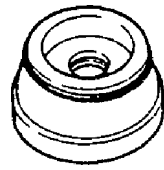
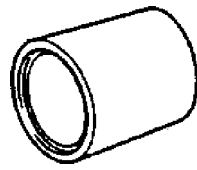
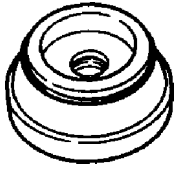
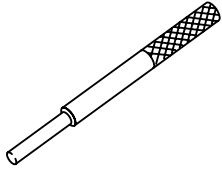
05-60 SERVICE TOOLS

SERVICE TOOLS 05-60-1

SERVICE TOOLS

E5U05600000M01

05-60

<p>49 0305 430A</p> <p>Main drive shaft pusher</p> 	<p>49 0500 330</p> <p>Bearing installer</p> 	<p>49 0180 321A</p> <p>Bearing installer</p> 
<p>49 0187 451A</p> <p>Interlock pin guide</p> 	<p>49 0862 350</p> <p>Shift fork guide</p> 	<p>49 0839 425C</p> <p>Bearing puller set</p> 
<p>49 H017 101</p> <p>Hook</p> 	<p>49 0259 440</p> <p>Mainshaft holder</p> 	<p>49 1243 465A</p> <p>Mainshaft locknut wrench</p> 
<p>49 0710 520</p> <p>Bearing puller</p> 	<p>49 0636 145</p> <p>Fan pulley boss puller</p> 	<p>49 B025 0A0</p> <p>Oil seal installer</p> 
<p>49 F401 331</p> <p>Body (Part of 49 F401 330B)</p> 	<p>49 F027 005</p> <p>Attachment φ62</p> 	<p>49 F034 201</p> <p>Dust boot installer</p> 
<p>49 F027 007</p> <p>Attachment φ72</p> 	<p>49 0221 251A</p> <p>Valve Guide Installer</p> 	<p>49 D032 326A</p> <p>Attachment</p> 